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SAN FRANCISCO MASTER PLAN FOR WASTE WATER MANAGEMENT

PRELIMINARY BOOK OF PLATES

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SEPT. 15, 1971

SAN FRANCISCO MASTER PLAN FOR WASTE WATER MANAGEMENT

PRELIMINARY COMPREHENSIVE REPORT (BOOK OF PLATES)

PREPARED BY
DEPARTMENT OF PUBLIC WORKS
SEPTEMBER 1971

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CITY AND COUNTY OF SAN FRANCISCO

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PREFACE

THIS MASTER PLAN IS ONE OF THE SUB-REGIONAL STUDIES NOW IN PROGRESS THROUGHOUT THE BAY AREA FROM WHICH A REGIONAL WATER QUALITY MANAGEMENT PLAN CAN BE EVOLVED. THE PLAN CONSISTS OF A SUMMARY REPORT PREPARED FOR NON-TECHNICAL DECISION MAKERS, AND A COMPREHENSIVE REPORT WITH ITS TEXT AND BOOK OF PLATES BOUND SEPARATELY FOR THE READER'S CONVENIENCE.

THIS MASTER PLAN ALSO IS CONSTITUTED BY THE TECHNICAL REPORTS ON THE LIST OF REFERENCES AND AN ORGANIZED FILE OF WORK PAPERS TO SUBSTANTIATE THE FINDINGS AND RECOMMENDATIONS.

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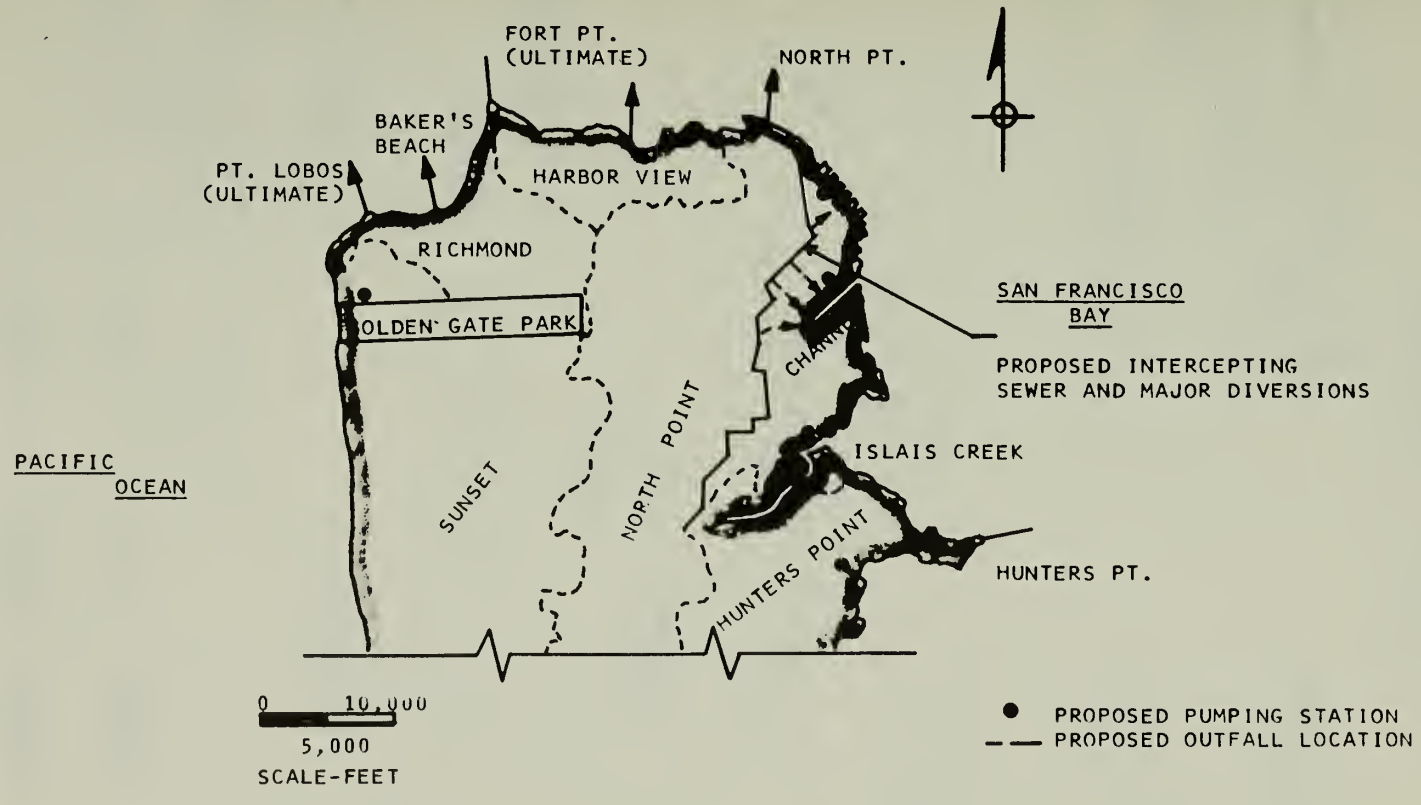


PROPOSALS OF GRUNSKY
CIRCA 1893
CITY & COUNTY OF SAN FRANCISCO

PLATE I-1

PLATE I-2

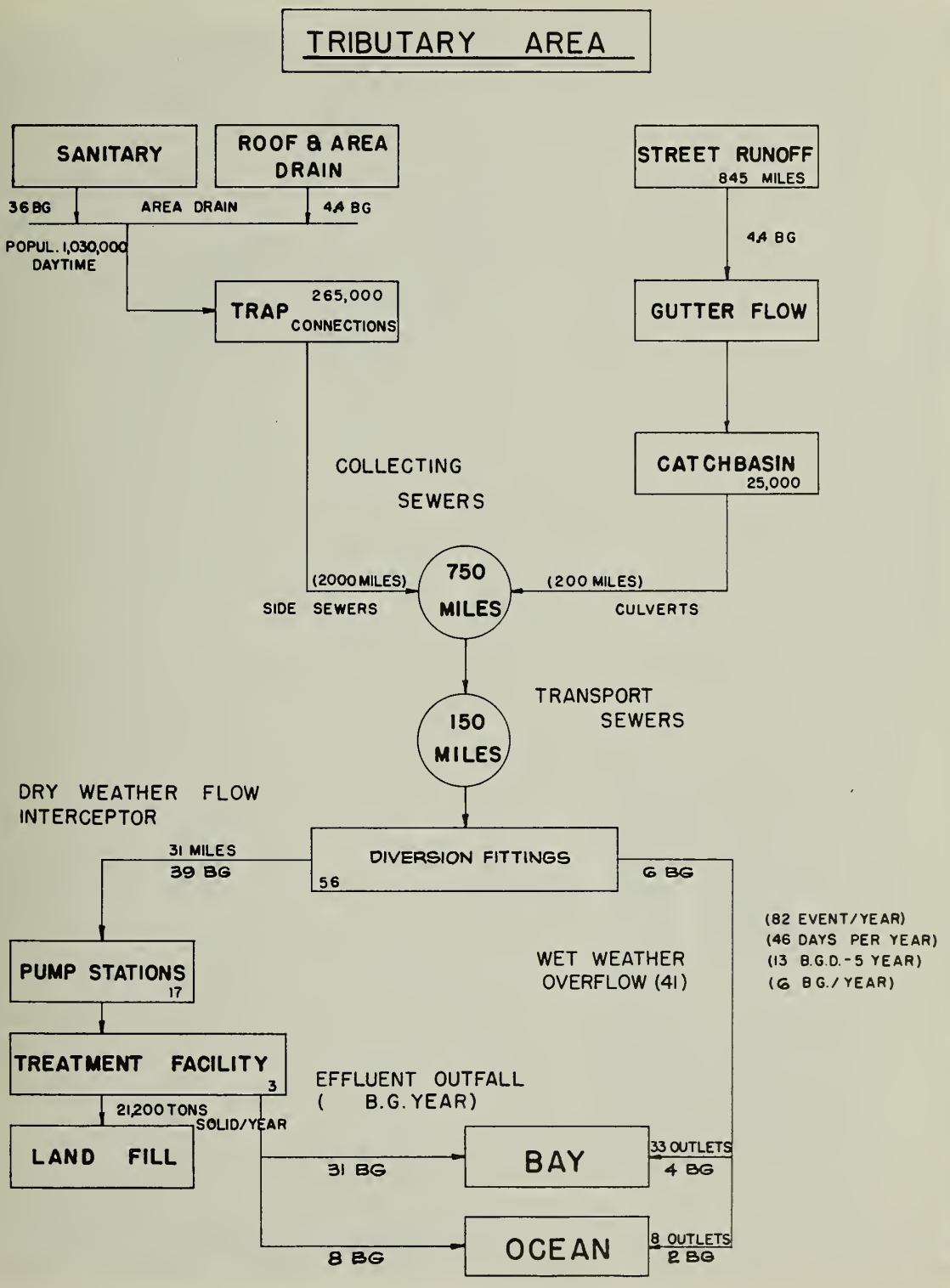

TRIBUTARY AREA
SANITARY
ROOF & AREA DRAIN
STREET RUNOFF
845 MILES
36 BG
AREA DRAIN
4.4 BG
4.4 BG
POPUL. 1,030,000 DAYTIME
TRAP
265,000 CONNECTIONS
GUTTER FLOW
COLLECTING SEWERS
CATCHBASIN
25,000
(2000 MILES)
SIDE SEWERS
750 MILES
(200 MILES)
CULVERTS
150 MILES
TRANSPORT SEWERS
DRY WEATHER FLOW INTERCEPTOR
31 MILES
39 BG
DIVERSION FITTINGS
56
6 BG
(82 EVENT/YEAR)
(46 DAYS PER YEAR)
(13 B.G.D.-5 YEAR)
(6 B.G./YEAR)
PUMP STATIONS
17
WET WEATHER OVERFLOW (41)
TREATMENT FACILITY
3
EFFLUENT OUTFALL
(B.G. YEAR)
21,200 TONS SOLID/YEAR
LAND FILL
31 BG
BAY
33 OUTLETS
4 BG
8 BG
OCEAN
8 OUTLETS
2 BG

PLATE I-3

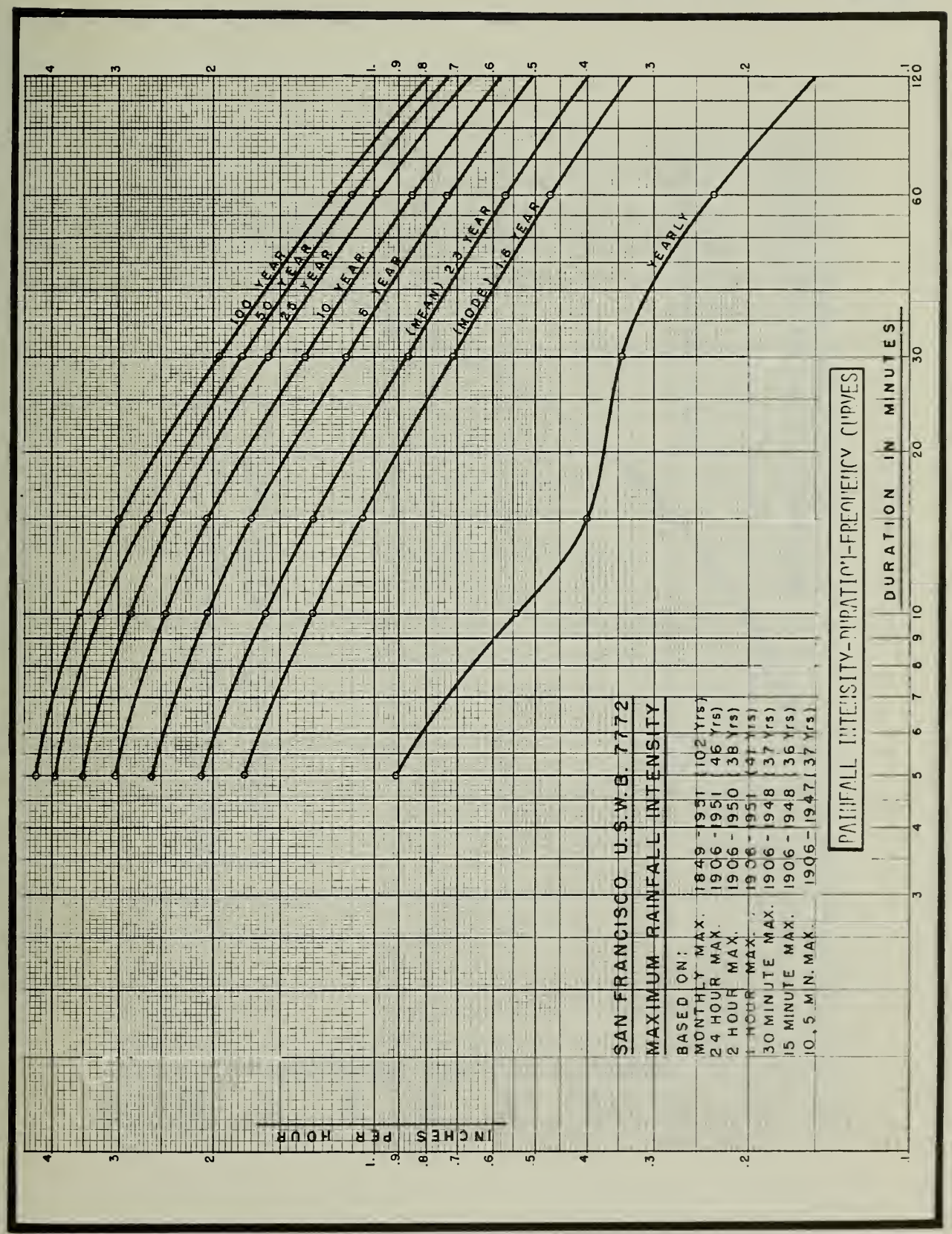
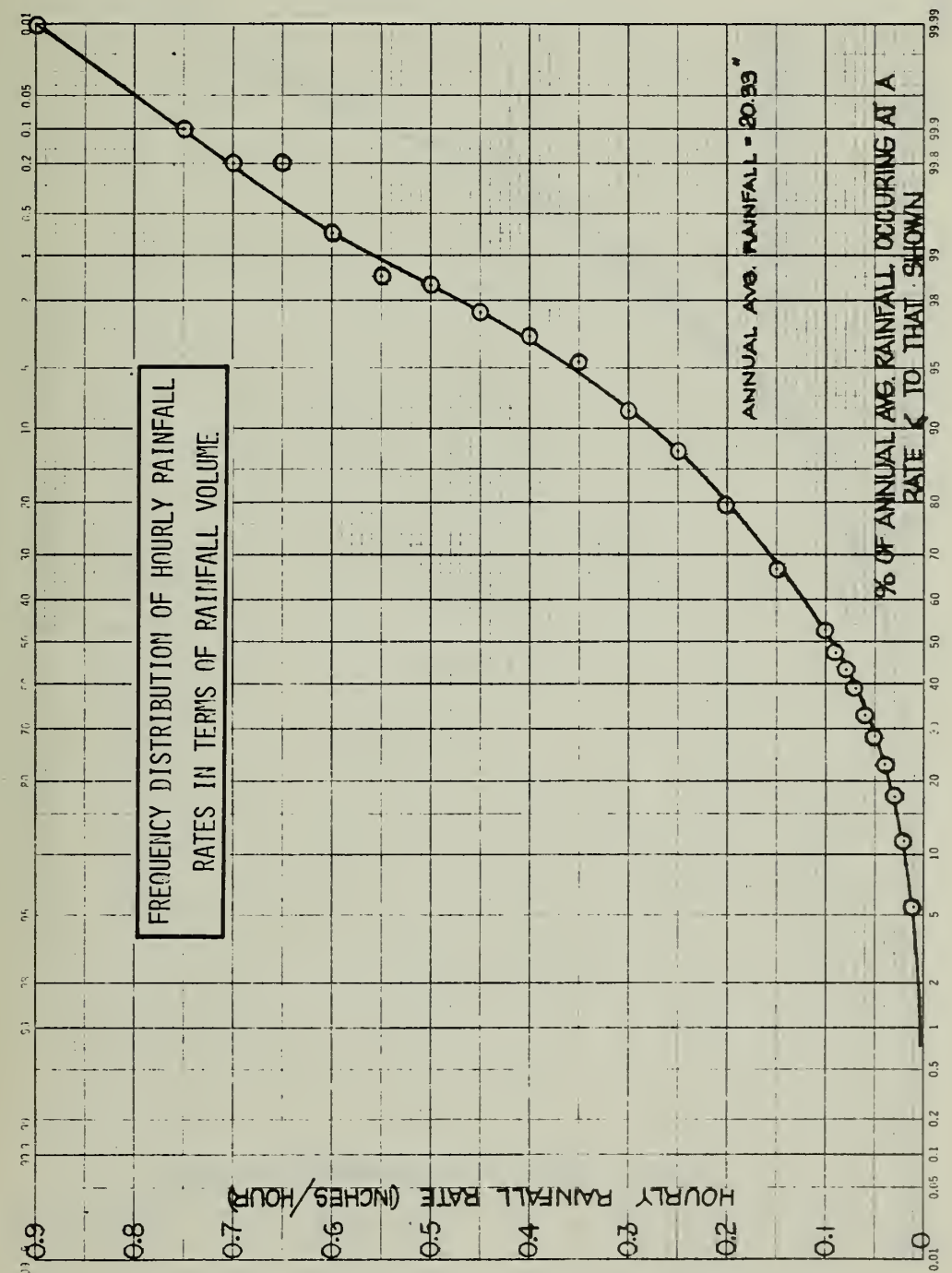

RAINFALL INTENSITY-DURATION-FREQUENCY CURVES
DURATION IN MINUTES
INCHES PER HOUR
100 YEAR
50 YEAR
25 YEAR
10 YEAR
5 YEAR
(MEAN) 2.3 YEAR
(MODE) 1.6 YEAR
YEARLY
SAN FRANCISCO U.S.W.B. 7772
MAXIMUM RAINFALL INTENSITY
BASED ON:
MONTHLY MAX. 1849 - 1951 (102 Yrs)
24 HOUR MAX. 1906 - 1951 (46 Yrs)
2 HOUR MAX. 1906 - 1950 (38 Yrs)
1 HOUR MAX. 1906 - 1951 (37 Yrs)
30 MINUTE MAX. 1906 - 1948 (37 Yrs)
15 MINUTE MAX. 1906 - 1948 (36 Yrs)
10, 5 MIN. MAX. 1906 - 1947 (37 Yrs)

PLATE I-4


FREQUENCY DISTRIBUTION OF HOURLY RAINFALL
RATES IN TERMS OF RAINFALL VOLUME
ANNUAL AVG. RAINFALL = 20.33"
% OF ANNUAL AVG. RAINFALL OCCURING AT A
RATE K TO THAT SHOWN
HOURLY RAINFALL RATE (INCHES/HOUR)
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0.01
0.05
0.1
0.2
0.5
1
2
5
10
20
30
40
50
60
70
80
90
95
98
99
99.8
99.9
99.99

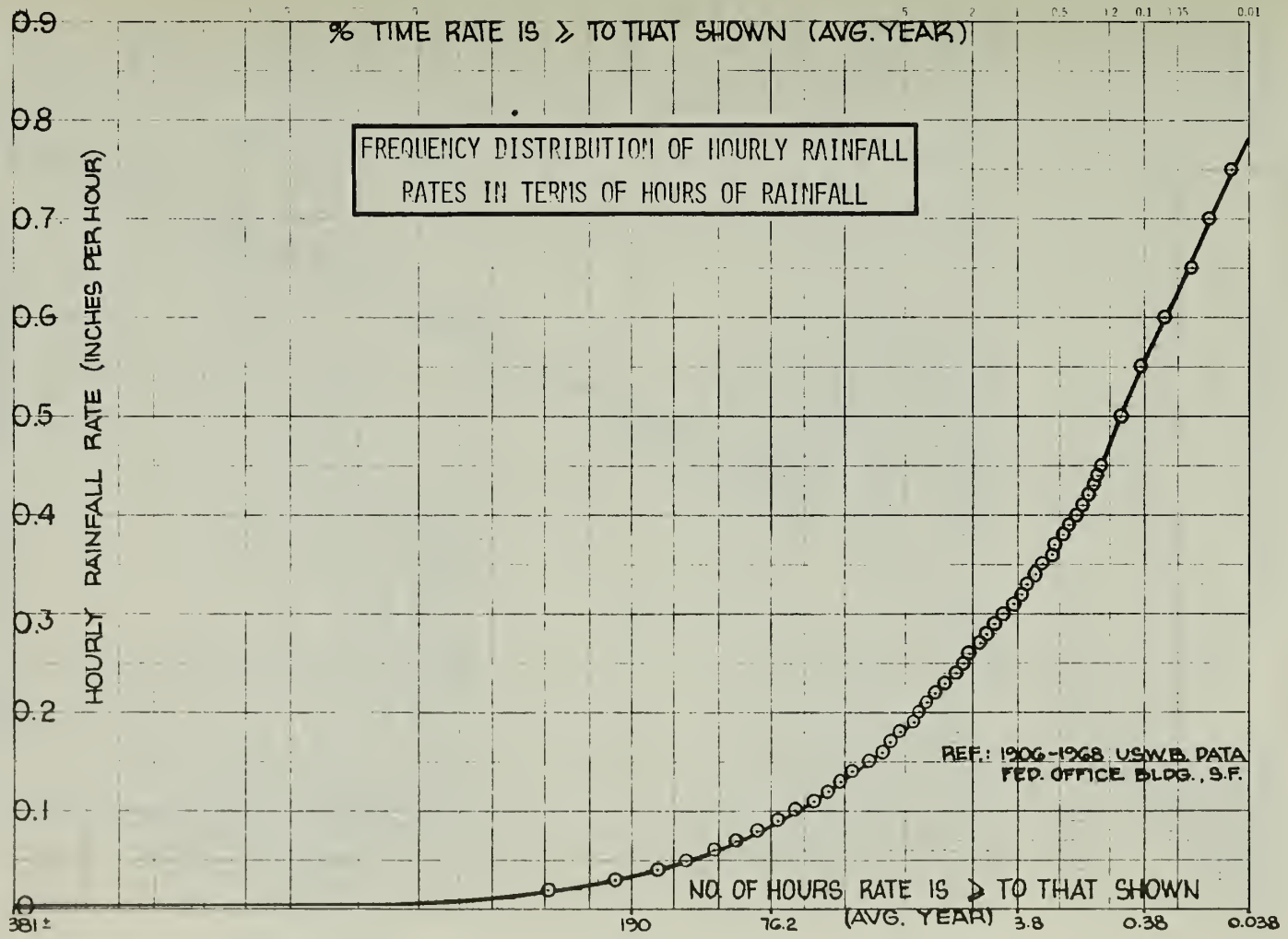
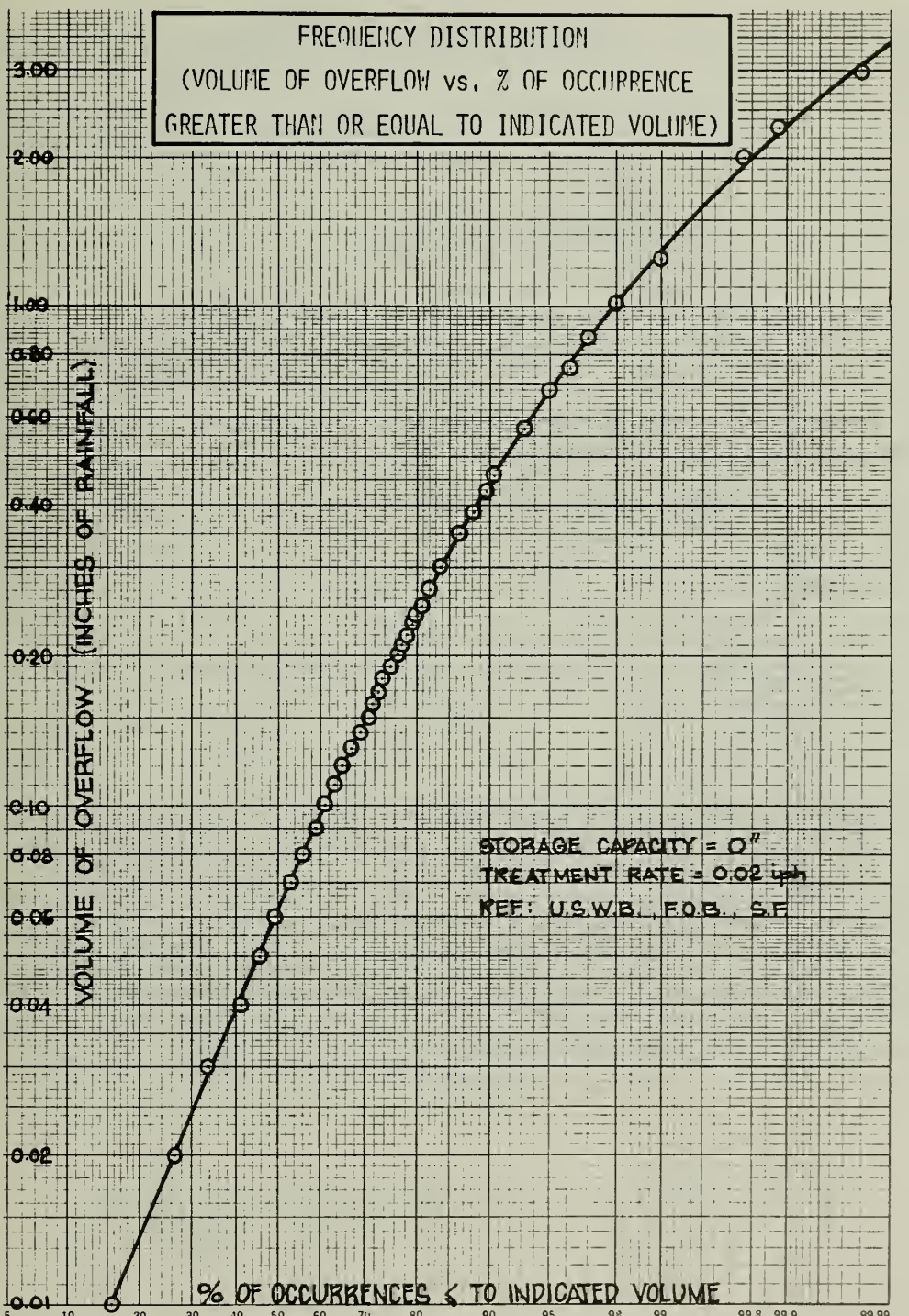
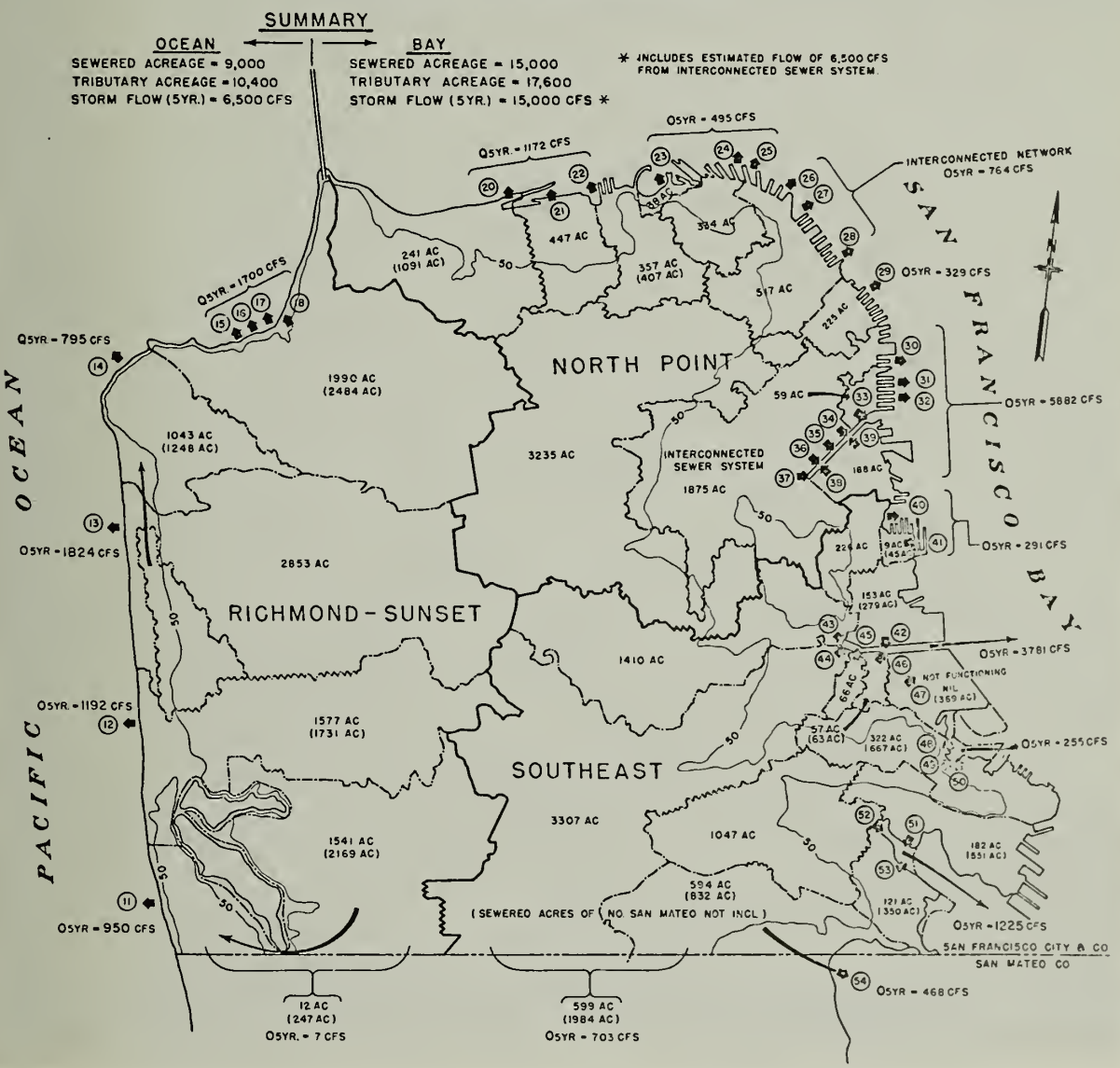

% TIME RATE IS ≥ TO THAT SHOWN (AVG. YEAR)
FREQUENCY DISTRIBUTION OF HOURLY RAINFALL RATES IN TERMS OF HOURS OF RAINFALL
HOURLY RAINFALL RATE (INCHES PER HOUR)
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
REF.: 1906-1968 U.S.W.B. DATA FED. OFFICE BLDG., S.F.
NO. OF HOURS RATE IS ≥ TO THAT SHOWN (AVG. YEAR)
381 ±
190
76.2
3.8
0.38
0.038

PLATE I-5

PLATE I-6


FREQUENCY DISTRIBUTION
(VOLUME OF OVERFLOW vs. % OF OCCURRENCE
GREATER THAN OR EQUAL TO INDICATED VOLUME)
VOLUME OF OVERFLOW (INCHES OF RAINFALL)
3.00
2.00
1.00
0.80
0.60
0.40
0.20
0.10
0.08
0.06
0.04
0.02
0.01
% OF OCCURRENCES ≤ TO INDICATED VOLUME
5
10
20
30
40
50
60
70
80
90
95
98
99
99.8
99.9
99.99
STORAGE CAPACITY = 0"
TREATMENT RATE = 0.02 gph
REF: U.S.W.B., F.O.B., S.F.

SEWERED AND TRIBUTARY AREAS
CITY & COUNTY OF SAN FRANCISCO

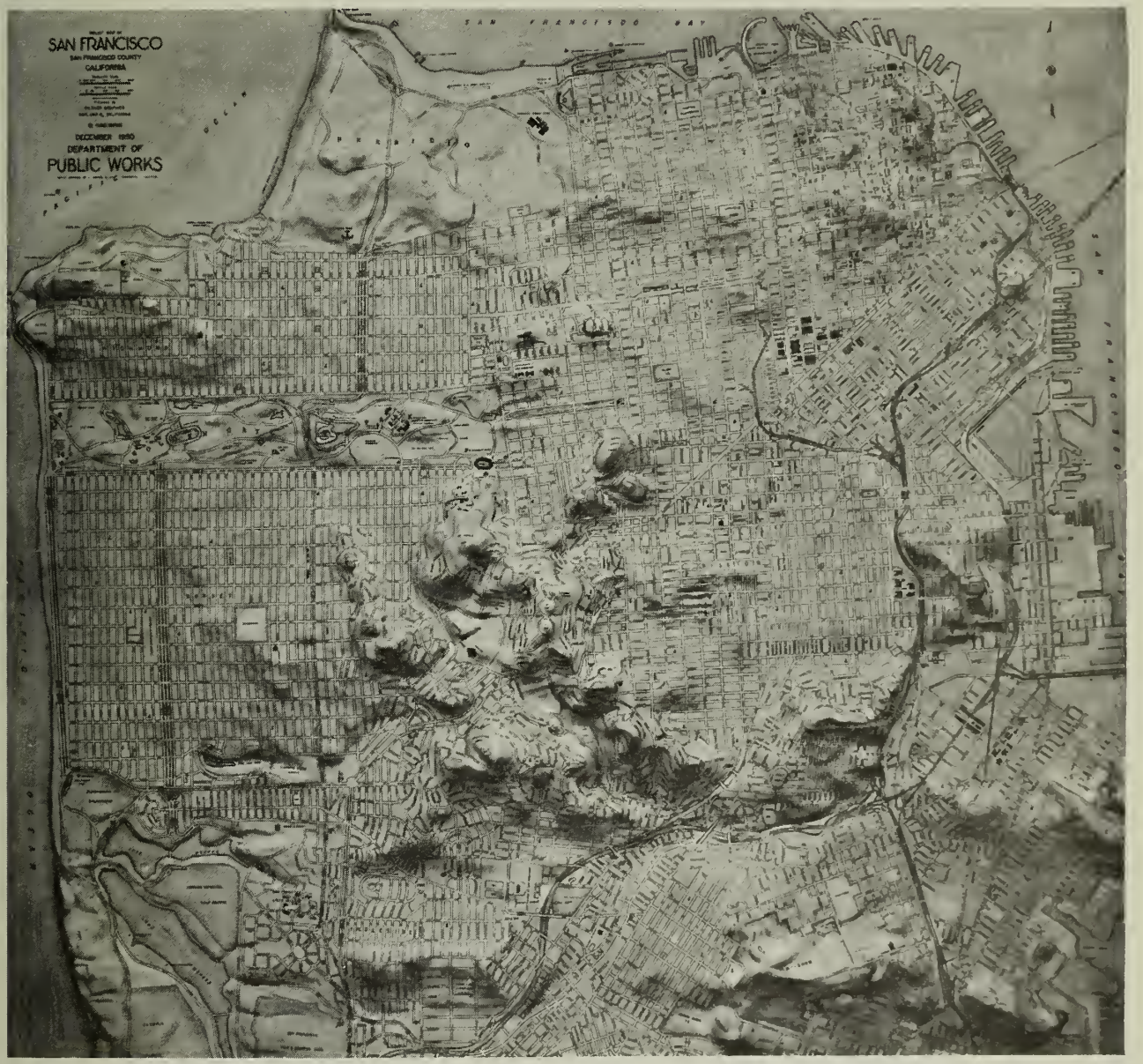


LEGEND

FIG. SEWERED ACREAGE
(FIG) TRIBUTARY ACREAGE
⇨ OUTFALL
(12) OUTFALL NO.

NOTE: AREAS WHERE ONLY ONE SET OF FIGURES IS SHOWN INDICATES SEWERED AND TRIBUTARY ACREAGES ARE THE SAME.

DRAWN BY: YOK DATE: 6-4-71 DSE 71-537

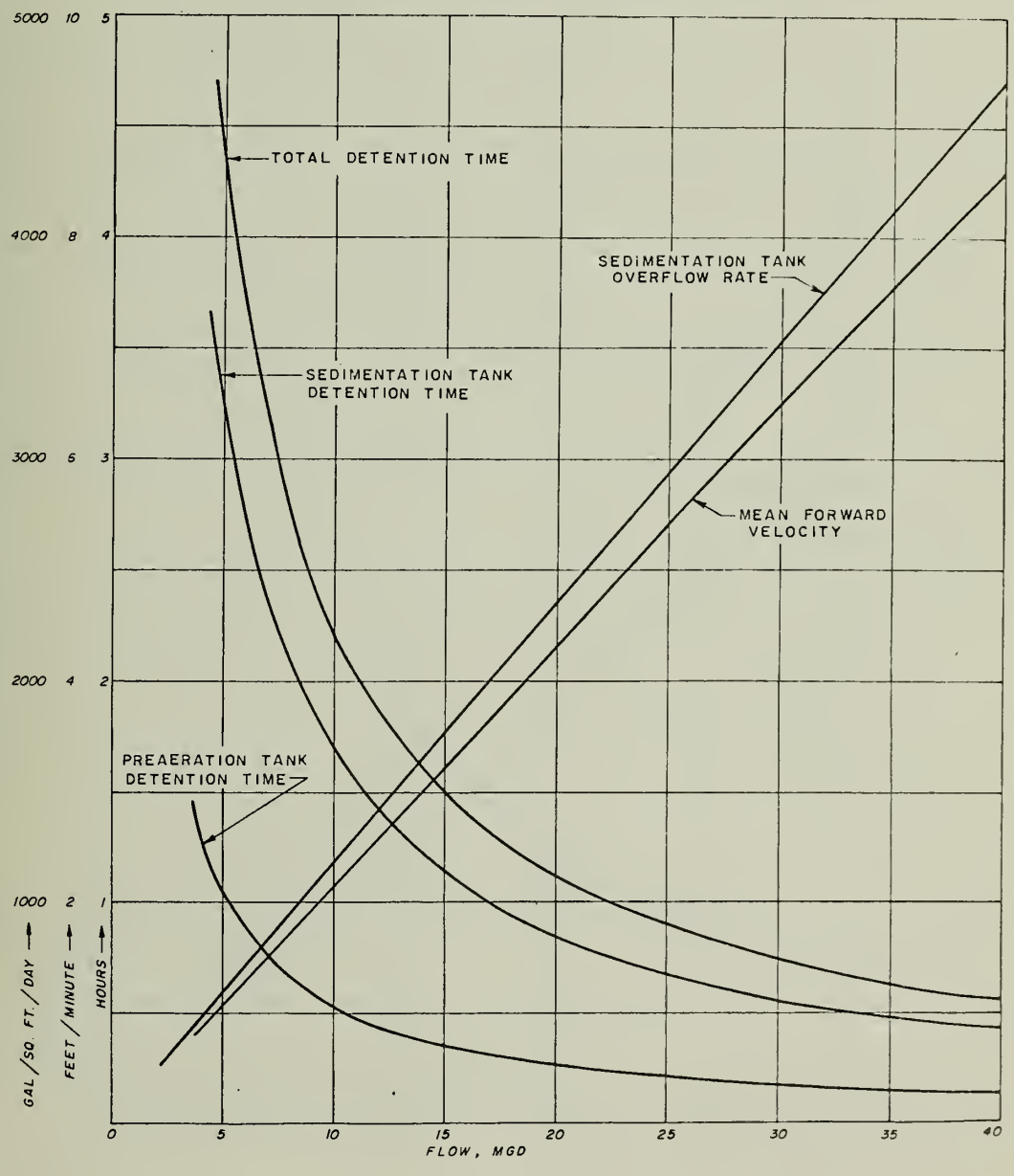


RELIEF OF SAN FRANCISCO

PLATE I-9

PREAERATION-SEDIMENTATION TANK PARAMETERS

NORTH POINT WATER POLLUTION CONTROL PLANT



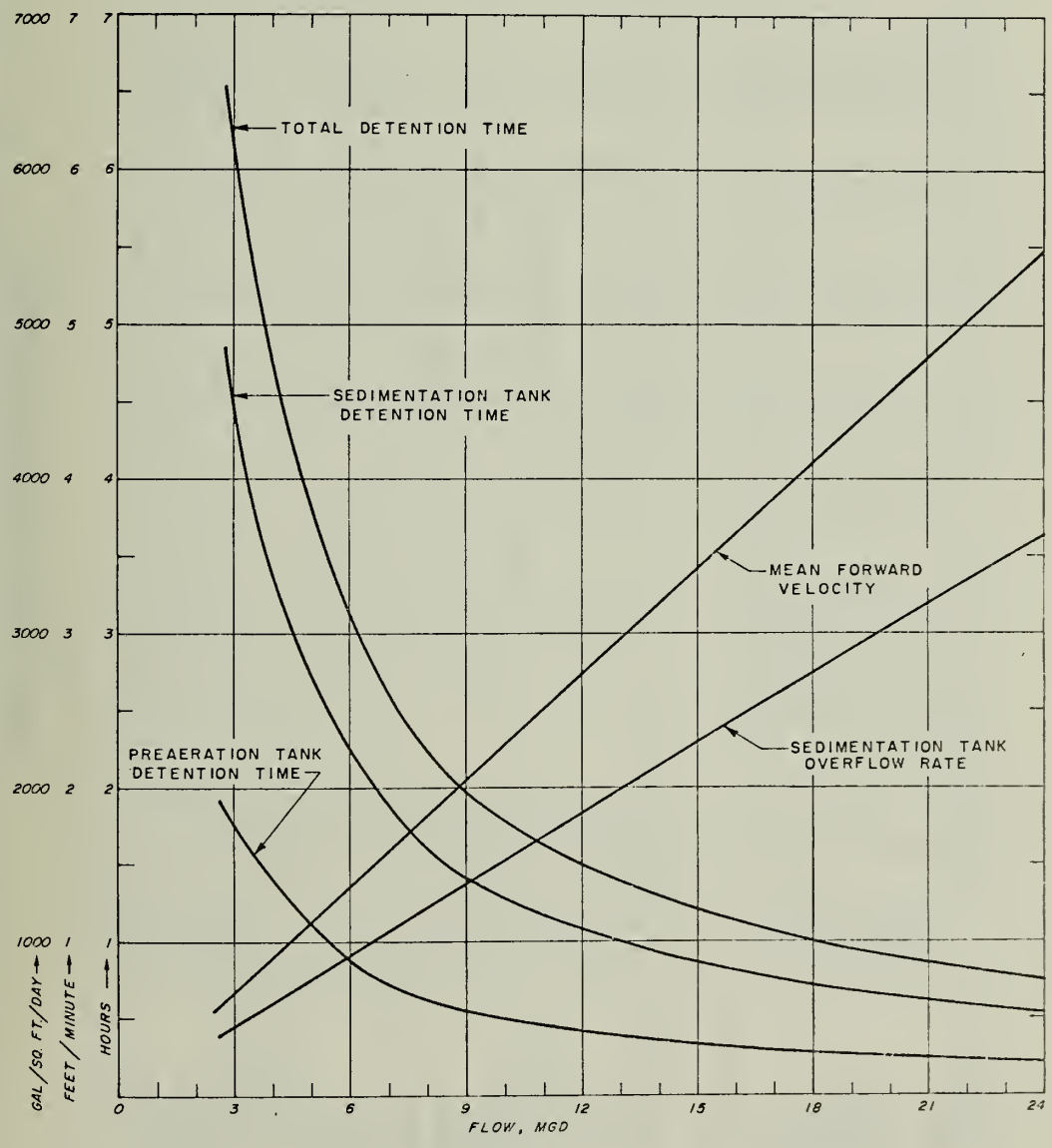
SEDIMENTATION TANK PARAMETERS

RICHMOND-SUNSET WATER POLLUTION CONTROL PLANT

PLATE I-11

NEW PREAERATION-SEDIMENTATION TANK PARAMETERS

SOUTHEAST WATER POLLUTION CONTROL PLANT



OUTFALL NAMES, SIZES, FLOWS AND AREAS

OUTFALL NO	NAME	CONDUIT SIZE	CONDUIT X-SEC. AREA (sf)	TRIBUTARY ACRES TOTAL	TRIBUTARY ACRES SEWERED	APPROX. Tc MIN.	APPROX. Tc SEC.	"C"	CA (TOTAL)	STORM FLOWS (cfs) 5 YR. I	5 YR. Q	10 YR. I	10 YR. Q	25 YR. I	25 YR. Q	50 YR. I	50 YR. Q	100 YR. I	100 YR. Q	REMARKS
11	Lake Merced	10'x11'-3"	95.0	2,169	1,541	30	24	.39	848	1.12	950	1.32	1,119	1.55	1,314	1.72	1,459	1.92	1,628	(1) 12 Ac. of No. San Mateo not incl. Q_{5yr} = 7cfs.
12	Vicente	2 @ 5'dia.	39.2	1,731	1,577	24	44	.55	946	1.26	1,192	1.50	1,419	1.75	1,656	1.99	1,883	2.20	2,081	(2) 75 acres to Mile Rock
13	Lincoln Way	3 @ 6'-6"	106.5	2,853	2,853	24	27	.50	1,425	1.28	1,824	1.51	2,138	1.78	2,537	2.01	2,864	2.22	3,164	(3) Incl. 504 acres G.G. Park & 494 acres Presidio.
14	Mile Rock	9'x11'	80.7	1,154	1,043	24	46	.54	626	1.27	795	1.50	939	1.75	1,095	1.99	1,245	2.20	1,377	
15	Sea Cliff P.S. #1	18" dia.	1.8	2,484	4	3	0	.70	3	2.59	8	3.01	9	3.51	11	4.00	12	4.16	13	(4) Incl. Ft. Miley 85 acres & G.G. Park 51 acres.
16	Sea Cliff	6' dia.	28.3		566	17	02	.67	380	1.57	597	1.88	714	2.20	836	2.48	942	2.80	1,064	
17	Sea Cliff P.S. #2	12" dia.	0.8		8	4	0	.70	6	2.59	16	3.01	18	3.51	21	4.00	24	4.16	25	(5) 5 min. T_c used for computations
18	Baker's Beach	7' dia.	38.5		1,412	20	28	.54	765	1.41	1,071	1.68	1,285	1.99	1,522	2.21	1,691	2.50	1,913	
	RICHMOND-SUNSET DISTRICT		390.8	10,391	9,004						6,461		7,641		8,992		10,120		11,265	(6) Incl. 23 acres from G.G. Park.
20	Baker Street	9' dia.	63.4	1,091	241	15	55	.60	145	1.60	232	1.95	283	2.29	332	2.57	373	2.88	418	(7) 5 min. T_c used for computations.
21	Pierce	8' dia.	50.3	447	447	15	40	.70	313	1.63	510	1.99	623	2.32	726	2.60	814	2.90	908	(8) Incl. 319 acres from G.G. Park.
22	Laguna	6' dia.	28.3	407	357	13	53	.70	250	1.72	430	2.10	525	2.50	625	2.79	698	3.10	775	
23	Hyde	24" dia.	3.1	38	38	7	11	.80	30	2.33	70	2.79	84	3.20	96	3.65	110	4.00	120	(9) Incl. 850 acres from Presidio.
24	Beach	6'x7'	41.1	314	314	12	52	.75	236	1.80	425	2.19	517	2.56	604	2.88	680	3.19	753	
25	Grant (Beach St. Relief)	36" dia.	7.1	20	20			.75	15											(10) (Fig.) = Total Q including estimated flow from interconnected network.
26	Sansome	2 @ 5'-6"x 6'-6"	69.5								Part of interconnected network.									(11) 464 sewered acres of No. San Mateo not incl. Q_{5yr} = 338 cfs.
27	Greenwich	6' dia.	28.3	517	517	(13	20)	(.83)	(429)	(1.78)		(2.40)		(2.51)		(2.80)		(3.15)		
28	Jackson	8'x9'-6"	72.3																	
29	Howard	7' dia.	38.5	225	225	14	10	.85	191	1.72	329	2.10	401	2.45	468	2.78	531	3.10	592	(12) Undeveloped area - Outlet not functioning.
30	Brannan	7'6"x6'	36.0																	(13) 135 sewered acres of No. San Mateo not incl. Q_{5yr} = 106 cfs.
34	North Side Fourth St.	6'-6" dia.	33.2																	
35	Fifth Street	7'-9"	47.2	3,110	3,110	(19	00)	(.77)	(3,935)	(1.47)		(1.78)		(2.09)		(2.34)		(2.61)		
36	North Side Sixth St.	6' dia.	28.3								Part of interconnected network.									
37	Seventh & Division	3 @ 8'-3"x 9'-6"	224.2																	
31	Townsend	2'x3'	6.0		22	5	38	.75	17	2.55	43	2.98	51	3.47	59	3.88	66	4.11	70	Note:
32	Berry	15" dia.	1.2	59	7	5	24	.60	4	2.58	10	3.00	12	3.48	14	3.90	16	4.14	17	(1) Refers to Outfall #11.
33	Third Street	2'-6"x3'-9"	7.3		30	11	41	.75	23	1.90	44	2.28	52	2.65	61	3.00	69	3.35	77	(2) Refers to Outfall #12.
38	South Side Sixth St.	3'-6"x5'-3"	14.0	188	63	10	25	.65	41	2.00	82	2.40	98	2.80	115	3.16	130	3.50	144	(3) Refers to Outfall #13.
39	South Side Fourth St.	2'-6"x3'-9"	7.3		125	15	27	.60	94	1.65	155	2.00	188	2.35	221	2.60	244	2.90	273	(4) Refers to Outfall #14.
	NORTH POINT DISTRICT		972.3	8,416	7,510						2,330		2,834		3,321		3,731		4,147	(5) Refers to Outfall #15.
											(8,879)		(10,868)		(12,618)		(14,139		(15,768)	(6) Refers to Outfall #16.
40	Mariposa	6' dia.	28.3	226	226	11	42	.65	147	1.90	279	2.28	335	2.65	390	3.00	441	3.35	492	(7) Refers to Outfall #17.
41	20th St.(Beth. Shipyd - Flow Unk.)	24" dia.	3.1	45	9	6	00	.70	5	2.49	12	2.90	15	3.44	17	3.80	19	4.08	20	(8) Refers to Outfall #18.
42	North Side Third St.	3'x6"x5'-3"	14.0	279	153	19	43	.80	92	1.45	133	1.71	157	2.01	185	2.28	210	2.57	236	(9) Refers to Outfall #20.
43	Marin	8'x10'	74.7	1,410	1,410	25	31	.85	917	1.23	1,128	1.48	1,357	1.71	1,568	1.95	1,788	2.15	1,972	(10) Refers to NP District.
44	Selby	3 @ 7'x10'	209.1	3,307	3,307	29	32	.85	2,150	1.13	2,408	1.33	2,860	1.56	3,354	1.76	3,784	1.96	4,214	(11) Refers to Outfall #45.
45	Rankin	5' dia.	19.6	66	66	18	28	.80	40	1.55	60	1.80	72	2.10	84	2.35	94	2.65	106	(12) Refers to Outfall #47.
46	South Side Third St.	2'-6"x3'-9"	7.3	63	57	14	29	.55	31	1.69	52	2.06	64	2.40	74	2.70	84	3.00	93	(13) Refers to Outfall #54.
47	Mendell	4' dia.	12.6	369	nil	8	00	.80												
48	Evans	6' dia.	28.3	667	260	34	13	.80	156	1.03	161	1.21	189	1.41	220	1.58	246	1.75	273	
49	Hudson	30" dia.	4.9		45	5	21	.80	27	2.55	70	3.00	81	3.50	95	3.93	107	4.15	112	
50	Griffith North	21" dia.	2.4		17	6	40	.80	10	2.39	24	2.81	28	3.24	33	3.69	37	4.02	40	
51	Griffith South	5'-6" dia.	23.8	551	182	19	06	.80	109	1.48	159	1.75	191	2.07	226	2.31	252	2.59	283	
52	Yosemite	9'x7'-3"	52.9																	
		11'-6"x6'-6"	69.6	1,047	1,047	18	28	.80	628	1.53	942	1.80	1,130	2.10	1,319	2.35	1,476	2.65	1,664	
53	Fitch	619" dia.	35.8	350	121	14	24	.80	73	1.70	124	2.05	75	2.41	176	2.70	197	3.01	220	
54	Sunnydale	646" dia.	33.2	832	594	19	48	.85	327	1.43	468	1.72	562	2.01	657	2.28	746	2.56	837	
	S.E. COLLECTION SYSTEM		619.6	9,212	7,494						6,020		7,116		8,398		9,481		10,562	
	GRAND TOTAL		1,882.7	28,019	24,014						14,811		17,591		20,711		23,332		25,974	
											(21,360)		(25,625)		(30,008)		(33,740)		(37,595)	(GRAND TOTAL with Interconnected Network.)

PLATE I-12

ANNUAL RAW MASS EMISSIONS

CITY AND COUNTY OF SAN FRANCISCO

% Contribution to Total City

CONSTITUENT	DRY WEATHER EMISSIONS				RUNOFF EMISSIONS*				TOTAL RAW EMISSIONS				COMBINED SEWER OVERFLOW PORTION OF TOTAL			
	NP	RS	SE	Total	NP	RS	SE	Total	NP	RS	SE	Total	NP	RS	SE	Total
COD	55.7	16.7	20.9	93.3	2.5	2.1	2.1	6.7	58.2	18.8	23.0	100%	3.1	1.9	1.8	6.8
TSS	33.7	11.2	21.3	66.2	12.5	10.8	10.5	33.8	46.2	22.1	31.7	100%	9.3	7.6	7.7	24.6
TN	51.4	19.0	24.0	94.4	2.1	1.8	1.7	5.6	53.4	20.9	25.7	100%	2.6	1.6	1.8	6.0
OPP	55.4	23.9	19.5	98.8	0.5	0.4	0.3	1.2	55.8	24.3	19.9	100%	1.6	0.8	0.7	3.1
HEM	48.6	13.1	32.4	94.1	2.2	1.9	1.8	5.9	50.8	15.0	34.2	100%	2.6	1.6	2.0	6.2
Flotables	47.0	15.3	15.9	78.2	8.1	7.0	6.7	21.8	55.1	22.3	22.6	100%	6.6	5.1	5.1	16.8

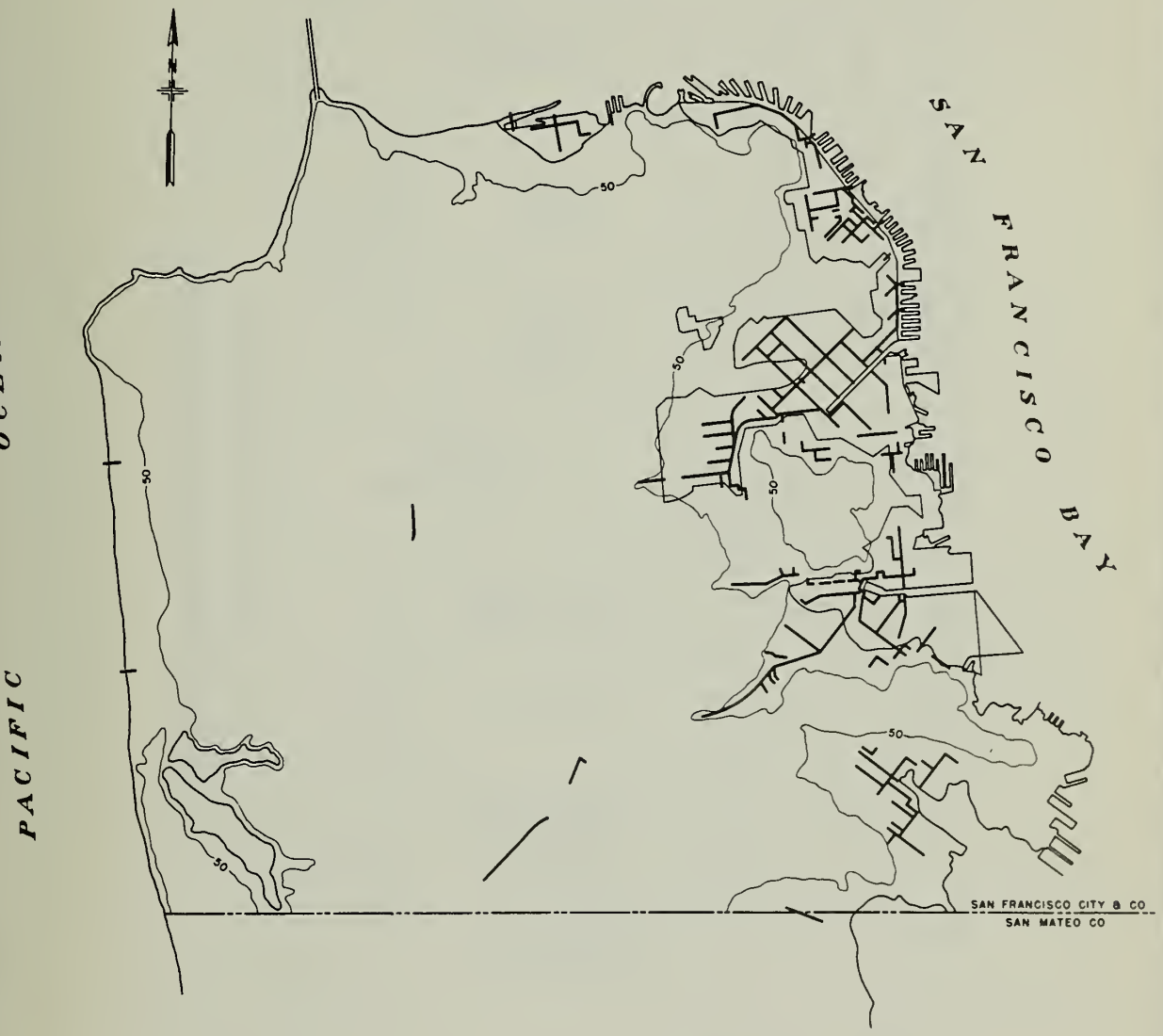
* Runoff emissions are defined as the emissions contained in combined sewer flows over those emissions attributable to dry weather emissions.

PLATE I-13

PLATE IV-1

CITY & COUNTY OF SAN FRANCISCO

LOCATIONS OF SUBSIDENCE AREAS AND
SEWERS SUPPORTED ON PILES



LEGEND

AREA OF SUBSIDENCE AFTER 1906 EARTHQUAKE AND FIRE (1906)

SEWERS SUPPORTED BY PILES

DSE 71-535

DRAWN BY YDK DATE 4-26-71

SEWERAGE SERVICE AREA CHARACTERISTICS

CITY & COUNTY OF SAN FRANCISCO

SEWERAGE SERVICE AREA	TYPE OF LAND USE (Percent of Gross Area)				TOTAL GROSS AREA (In Acres)	HOUSING (No. of Units)		POPULATION (Total Number)	EMPLOYMENT (Total Number)
	INDUSTRIES & MANUFACTURING	COMMERCIAL, TRANSPORTATION, & UTILITIES	RESIDENTIAL	PUBLIC LANDS & ALL OTHERS		SINGLE FAMILY	MULTI-FAMILY		
N.P.W.P.C.P.	15	16	39	30	8,416	20,612	147,644	353,836	449,896
R.S.W.P.C.P.	2	4	56	38	10,391	50,718	30,755	220,028	49,516
S.E.W.P.C.P.	13	4	43	40	9,212	35,435	17,828	166,251	57,252
TOTAL CITY	10	8	46	36	28,019	106,765	196,227	740,115	556,664

PLATE IV-2

CITY & COUNTY OF SAN FRANCISCO

LOCATION OF THE TREATMENT PLANTS, THEIR OUTFALLS, AND APPROXIMATE AREA BOUNDARIES

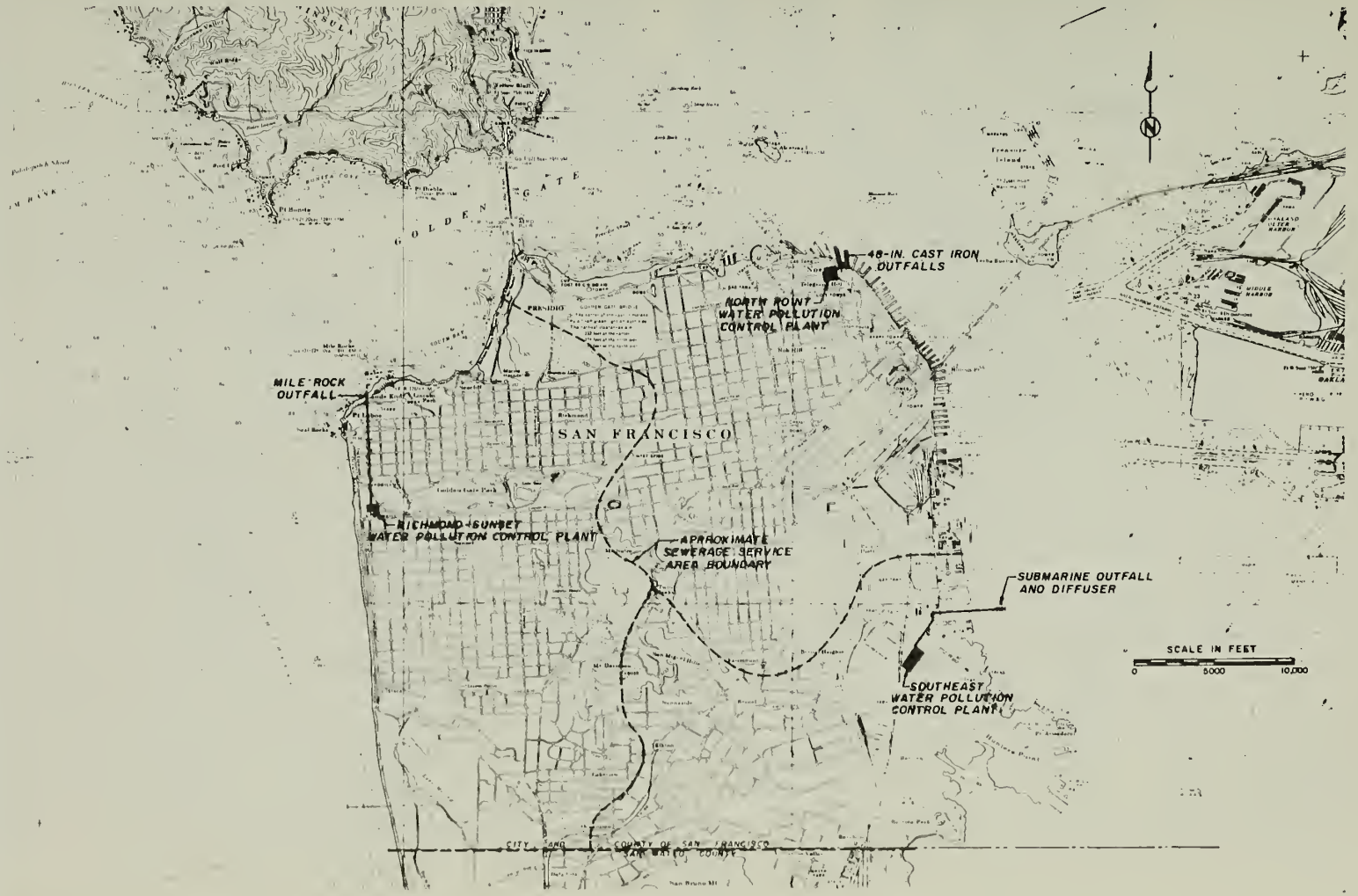
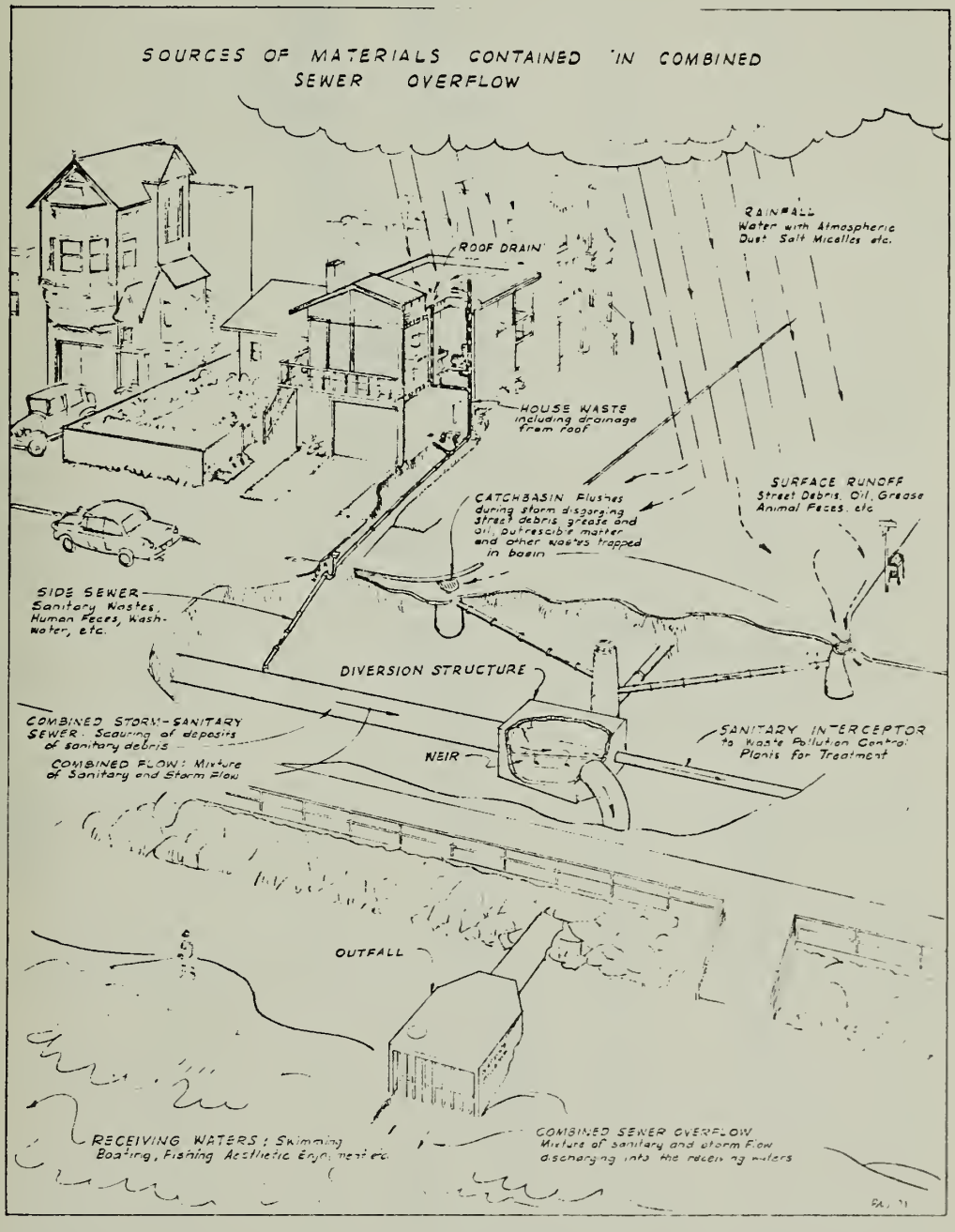


PLATE IV-3


SOURCES OF MATERIALS CONTAINED IN COMBINED SEWER OVERFLOW
RAINFALL Water with Atmospheric Dust Salt Micelles etc.
ROOF DRAIN
HOUSE WASTE including drainage from roof
SURFACE RUNOFF Street Debris, Oil, Grease Animal Feces, etc
CATCHBASIN Flushes during storm discharging street debris grease and oil, putrescible matter and other wastes trapped in basin
SIDE SEWER Sanitary Wastes, Human Feces, Wash-water, etc.
DIVERSION STRUCTURE
COMBINED STORM-SANITARY SEWER Scouring of deposits of sanitary debris
COMBINED FLOW: Mixture of Sanitary and Storm Flow
WEIR
SANITARY INTERCEPTOR to Waste Pollution Control Plants for Treatment
OUTFALL
RECEIVING WATERS: Swimming Boating, Fishing Aesthetic Enjoyment etc.
COMBINED SEWER OVERFLOW Mixture of sanitary and storm flow discharging into the receiving waters

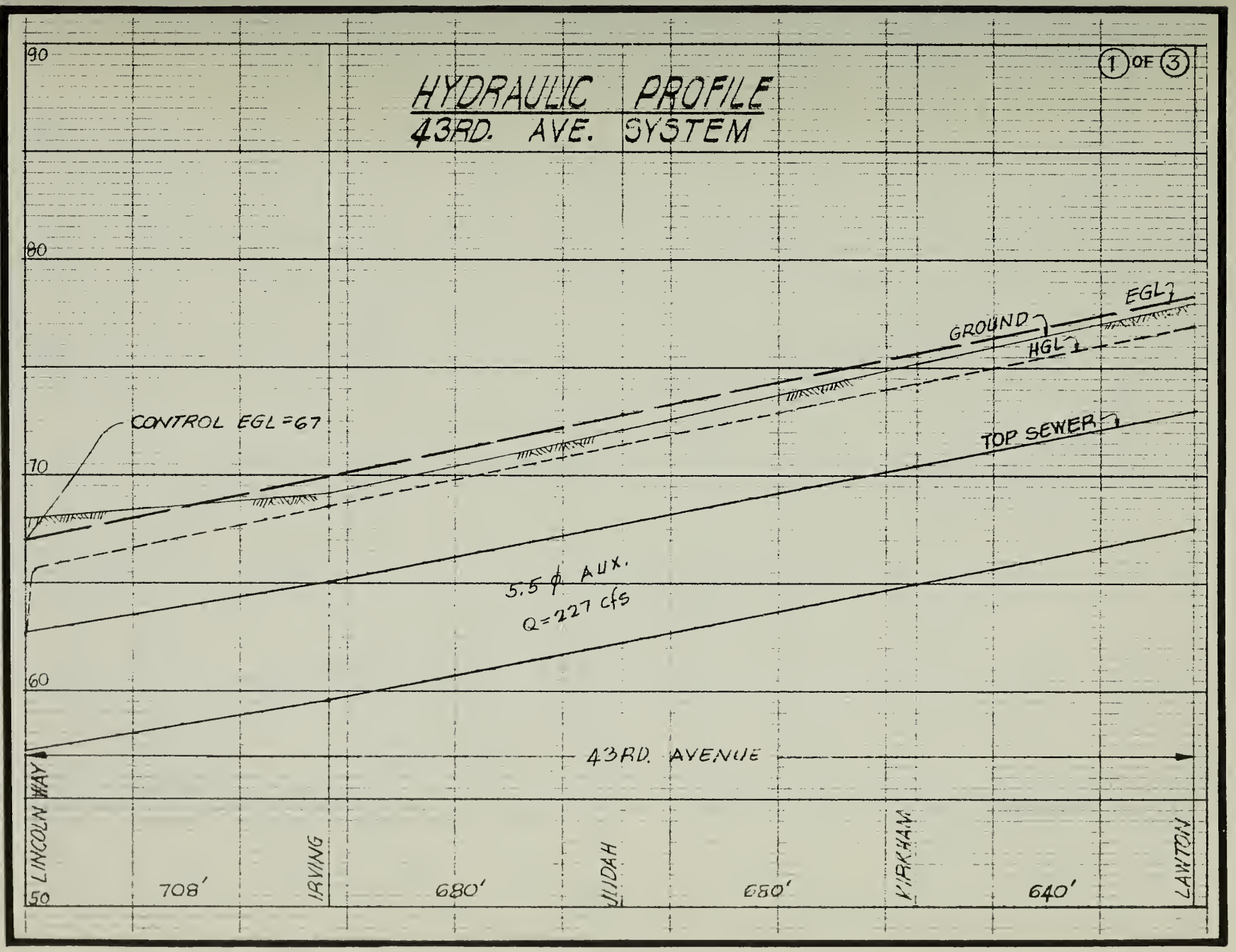

HYDRAULIC PROFILE
43RD. AVE. SYSTEM
1 OF 3
90
80
70
60
50
GROUND
EGL
HGL
CONTROL EGL=67
TOP SEWER
5.5 ϕ AUX.
Q=227 cfs
43RD. AVENUE
LINCOLN WAY
708'
IRVING
680'
VIJDAH
680'
KIRKHAM
640'
LAWTON

PLATE IV-5A

PLATE IV-5B

(2) OF (3)
EGL
GROUND
HGL
TOP OF CEMENT
4'x6' EXT. Q=432 cfs
4'x6' AUX (5.6' Φ) 227 cfs
Q=454 cfs
40TH
MORAGA
MORAGA
294'
415T
600'
415T
27.4'
42ND
LAWTON
359'
43RD
LAWTON
105
100
90
80
70
65

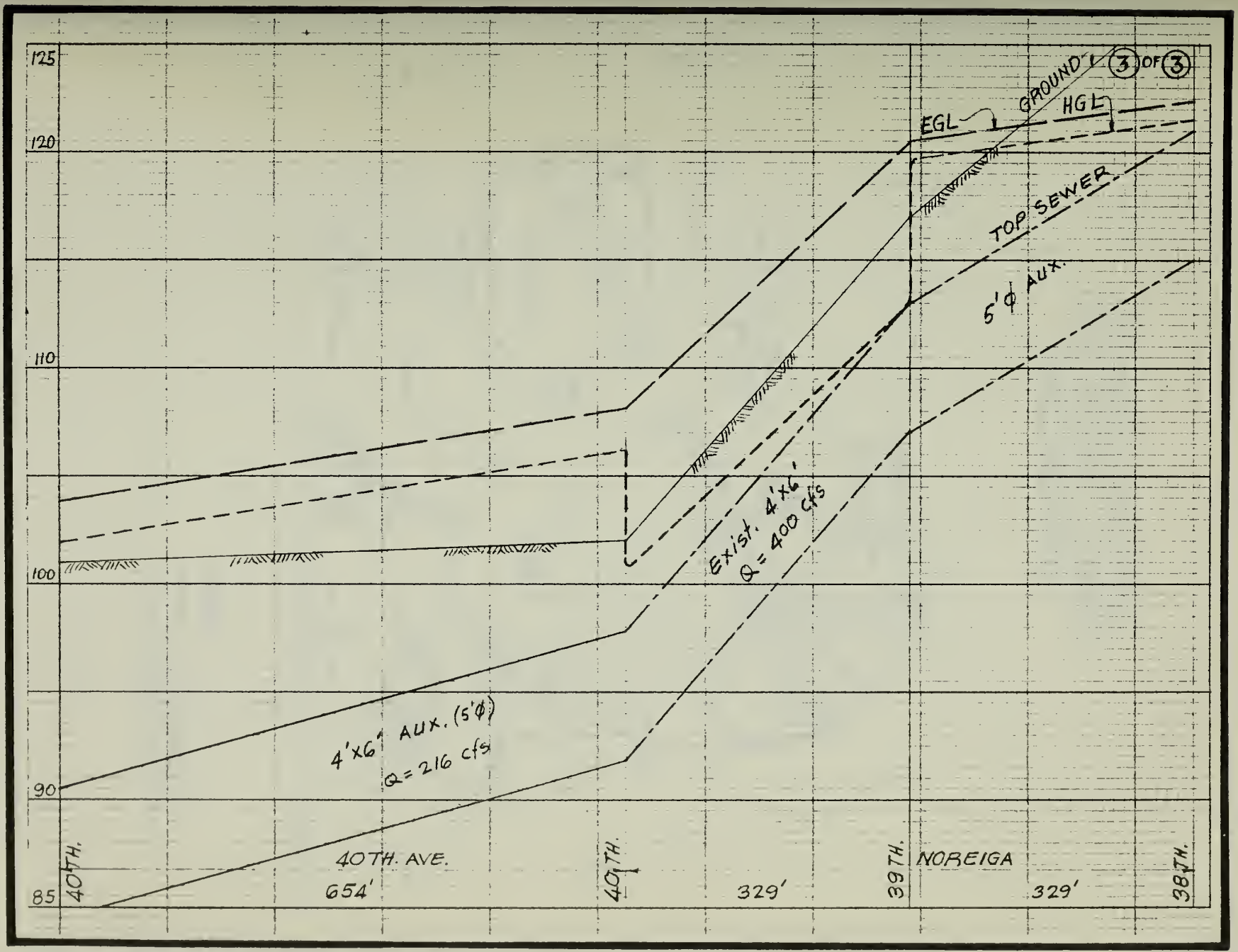
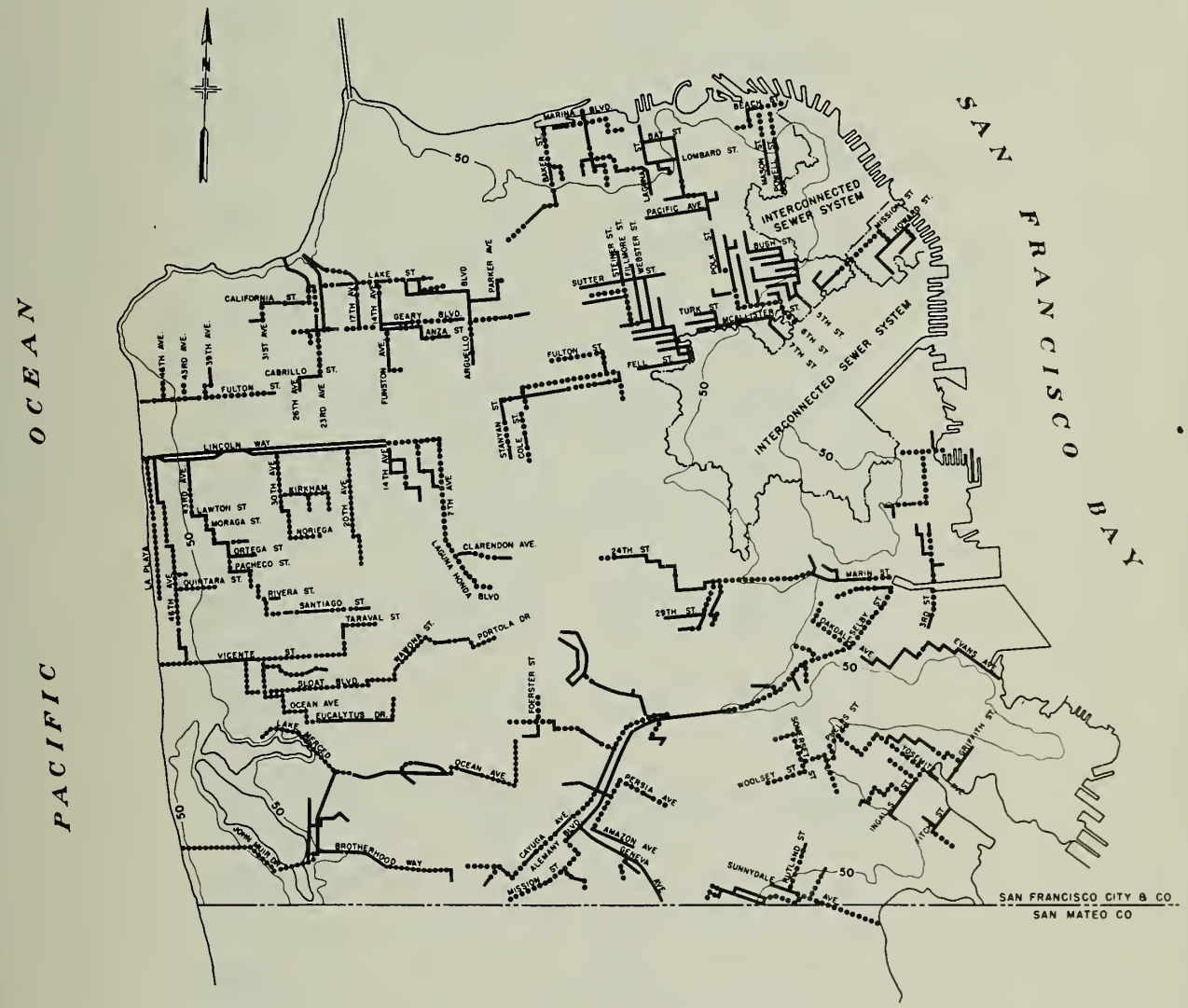

125
120
110
100
90
85
GROUND
3 OF 3
EGL
HGL
TOP SEWER
5'ϕ AUX.
Exist. 4'x6'
Q = 400 cfs
4'x6' AUX. (5'ϕ)
Q = 216 cfs
40TH.
40TH. AVE.
654'
40TH.
329'
39TH.
NOREIGA
329'
38TH.

PLATE IV-5C

CITY & COUNTY OF SAN FRANCISCO
LOCATION OF ADEQUATE & INADEQUATE
MAJOR TRANSPORT SEWERS



LEGEND

- ADEQUATE TRANSPORT SEWERS (5 YEAR STORM FLOW)
- INADEQUATE TRANSPORT SEWERS

SEWER INADEQUACY SUMMARY —— TRANSPORT SYSTEM

OUTFALL NO.	DIST. NO.	TOTAL MILES SEWER INVES.	TOTAL MILES INAD. SEWER	TOTAL COST MILLION $	MILES SEWER 99-85% ADEQ.	COST TO CORRECT MILLION $	MILES SEWER 85-70% ADEQ.	COST TO CORRECT MILLION $	MILES SEWER 70-55% ADEQ.	COST TO CORRECT MILLION $	MILES SEWER 55-40% ADEQ.	COST TO CORRECT MILLION $	MILES SEWER 40% ADEQ.	COST TO CORRECT MILLION $
11	Outfall	0.55	0.55	2.750			0.55	2.750						
	110	1.62	0.79	1.805	0.18	0.225	0.61	1.580						
	112	2.10	1.53	1.047	0.72	-	0.54	0.554	0.04	0.057	0.23	0.436	-	-
	113	1.30	0.56	0.557	-	-	0.11	0.113	0.13	0.121	0.20	0.204	0.12	0.119
	114	1.96	0.70	0.202			0.10	0.088					0.60	0.114
Outfall Total		7.53	4.13	6.361	0.90	0.225	1.91	5.085	0.17	0.178	0.43	0.640	0.72	0.233
12	121	0.25	0.27	0.436	0.06	0.049	0.07	0.069	0.08	0.220	0.06	0.098		
	123	0.65	0.34	0.457	0.18	0.149	-	-	-	-	0.06	0.198	.10	.110
	124	2.64	2.37	2.776	0.17	0.145	0.36	0.284	0.85	0.960	0.61	0.747	0.38	0.640
	125	2.52	1.67	1.720	0.23	0.223	0.44	0.419	0.30	0.325	0.11	0.135	0.59	0.618
	126	1.10	0.95	0.943	-	-	0.35	0.306	0.18	0.176	0.30	0.335	0.12	0.126
Outfall Total		7.16	5.60	6.332	0.64	0.566	1.22	1.078	1.41	1.681	1.14	1.513	1.19	1.494
13	130,131, & 880	0.62	0.12	0.356	-	-	0.12	0.356	-	-	-	-	-	-
	132	1.30	1.21	1.187	-	-	0.52	0.499	-	-	0.23	0.220	0.46	0.468
	134 & 135	5.78	3.17	3.014	0.45	0.210	0.62	0.547	0.88	0.863	1.10	1.279	0.12	0.115
	136	2.53	1.45	1.196	0.06	0.037	0.06	0.039	0.69	0.675	0.25	0.258	0.39	0.187
	137 & 138	3.04	1.53	1.531			0.48	0.491	0.12	0.129	0.67	0.556	0.26	0.355
	139	0.85	0.57	0.492	0.10	0.071	-	-	0.06	0.056	0.22	0.176	0.19	0.189
Outfall Total		14.12	8.05	7.776	0.61	0.318	1.80	1.932	1.75	1.723	2.47	2.489	1.42	1.314
14	140	0.12	0	-	-	-	-	-	-	-	-	-	-	-
	142	1.63	1.21	1.123	0.23	0.168	0.25	0.189	0.31	0.297	0.29	0.339	0.13	0.130
	144	2.40	1.94	1.820	0.57	0.166	0.52	0.655	0.55	0.808	0.30	0.191	-	-
Outfall Total		4.15	3.15	2.943	0.80	0.334	0.77	0.844	0.86	1.105	0.59	0.530	0.13	0.130
16	161	3.45	1.74	1.517	0.35	0.281	0.19	0.167	0.71	0.575	0.49	0.494	-	-
Outfall Total		3.45	1.74	1.517	0.35	0.281	0.19	0.167	0.71	0.575	0.49	0.494	-	-

PLATE IV-7A

SEWER INADEQUACY SUMMARY —— TRANSPORT SYSTEM

OUTFALL NO.	DIST. NO.	TOTAL MILES SEWER INVES.	TOTAL MILES INAD. SEWER	TOTAL COST MILLION $	MILES SEWER 99-85% ADEQ.	COST TO CORRECT MILLION $	MILES SEWER 85-70% ADEQ.	COST TO CORRECT MILLION $	MILES SEWER 70-55% ADEQ.	COST TO CORRECT MILLION $	MILES SEWER 55-40% ADEQ.	COST TO CORRECT MILLION $	MILES SEWER 40% ADEQ.	COST TO CORRECT MILLION $
18	Outfall	0.91	0.45	0.567	-	-	0.08	0.115	-	-	0.37	0.452	-	-
	181 & 182	2.93	1.40	1.052	0.62	0.363	0.60	0.485	0.12	0.148	-	-	0.06	0.056
	183	2.97	0.93	1.028	0.23	0.183	0.31	0.301	0.07	0.058	-	-	0.32	0.486
Outfall Total		6.81	2.78	2.647	0.85	0.546	0.99	0.901	0.19	0.206	0.37	0.452	0.38	0.542
20	Outfall	0.47	0.32	0.367	-	-	0.32	0.367	-	-	-	-	-	-
	200	0.87	0.23	0.169	-	-	0.07	0.045	0.16	0.124	-	-	-	-
Outfall Total		1.34	0.55	0.536	-	-	0.39	0.412	0.16	0.124	-	-	-	-
21	Outfall & 210	2.52	1.47	1.770	0.15	0.189	0.28	0.324	0.32	0.386	0.66	0.811	0.06	0.060
Outfall Total		2.52	1.47	1.770	0.15	0.189	0.28	0.324	0.32	0.386	0.66	0.811	0.06	0.060
22	Outfall & 220	3.0	0.29	.278	0.16	0.136	0.13	0.142	-	-	-	-	-	-
Outfall Total		3.0	0.29	.278	0.16	0.136	0.13	0.142	-	-	-	-	-	-
24	241	1.96	1.04	2.022	0.12	0.214	0.13	0.144	0.16	0.163	0.35	0.762	0.28	0.739
Outfall Total		1.96	1.04	2.022	0.12	0.214	0.13	0.144	0.16	0.163	0.35	0.762	0.28	0.739
29		2.05	.79	1.159	-	-	.33	.439	.29	.428	-	-	.17	.251
Outfall Total		2.05	.79	1.159	-	-	.33	.439	.29	.428	-	-	.17	.292
3P		0.22	-	-	-	-	-	-	-	-	-	-	-	-
Outfall Total		0.22	-	-	-	-	-	-	-	-	-	-	0.43	0.791
39		0.43	0.43	0.791	-	-	-	-	-	-	-	-	0.43	0.791
Outfall Total		0.43	0.43	0.791	-	-	-	-	-					
40		1.30	0.93	1.241	-	-	0.14	0.213	0.50	0.652	0.24	0.323	0.05	0.053
Outfall Total		1.30	0.93	1.241	-	-	0.14	0.213	0.50	0.652	0.24	0.323	0.05	0.053

PLATE IV-7B

SEWER INADEQUACY SUMMARY — TRANSPORT SYSTEM

OUTFALL NO.	DIST. NO.	TOTAL MILES SEWER INVES.	TOTAL MILES INAD. SEWER	TOTAL COST MILLION $	MILES SEWER 99-85% ADEQ.	COST TO CORRECT MILLION $	MILES SEWER 85-70% ADEQ.	COST TO CORRECT MILLION $	MILES SEWER 70-55% ADEQ.	COST TO CORRECT MILLION $	MILES SEWER 55-40% ADEQ.	COST TO CORRECT MILLION $	MILES SEWER 40% ADEQ.	COST TO CORRECT MILLION $
42		1.02	0.35	0.595	-	-	0.09	0.125	0.09	0.130	0.08	0.135	0.09	0.205
Outfall Total		1.02	0.35	0.595	-	-	0.09	0.125	0.09	0.130	0.08	0.135	0.09	0.205
43	430	1.86	1.08	3.144	-	-	0.18	0.195	0.59	0.833	0.31	2.116	-	-
	432	2.55	0.62	0.602	0.06	0.065	0.41	0.376	0.06	0.074	0.09	0.087	-	-
Outfall Total		4.41	1.70	3.746	0.06	0.065	0.59	0.571	0.65	0.907	0.40	2.203	-	-
44	440	2.54	2.07	13.34[illegible]	0.23	0.204	-	-	1.17	12.219	0.26	0.280	0.41	0.637
	441	1.54	0.59	3.590	-	-	0.02	0.019	0.05	0.114	0.52	3.457	-	-
	442	3.05	1.15	1.147	0.10	0.120	0.33	0.317	0.68	0.668	0.04	0.042	-	-
	443	0.78	0.18	0.223	0.05	0.049	.09	.133	-	-	0.04	0.041	-	-
	444	2.07	1.29	1.263	0.30	0.252	0.49	0.491	0.39	0.404	0.11	0.116	-	-
	445	2.15	1.05	1.066	0.17	0.163	0.49	0.472	0.14	0.156	0.17	0.184	0.08	0.091
	446	1.24	1.16	1.189	0.05	0.035	0.15	0.104	-	-	-	-	0.96	1.050
	447	1.31	-	-	-	-	-	-	-	-	-	-	-	-
	448	1.50	0.06	0.064	-	-	0.06	0.064	-	-	-	-	-	-
Outfall Total		16.18	7.55	21.882	0.90	0.823	1.63	1.600	2.43	13.561	1.14	4.120	1.45	1.778
45		0.10	-	-	-	-	-	-	-	-	-	-	-	-
Outfall Total		0.10	-	-	-	-	-	-	-	-	-	-	-	-
46		0.35	0.16	0.275	-	-	-	-	0.06	0.080	-	-	0.10	0.195
Outfall Total		0.35	0.16	0.275	-	-	-	-	0.06	0.080	-	-	0.10	0.195
48		1.62	0.11	0.113	-	-	0.11	0.113	-	-	-	-	-	-
Outfall Total		1.62	0.11	0.113	-	-	0.11	0.113	-	-	-	-	-	-
49		0.02	-	-	-	-	-	-	-	-	-	-	-	-
Outfall Total		0.02	-	-	-	-	-	-	-	-	-	-	-	-
51		1.33	0.35	0.436	0.10	0.125	0.25	0.311	-	-	-	-	-	-
Outfall Total		1.33	0.35	0.436	0.10	0.125	0.25	0.311	-	-	-	-	-	-

PLATE IV-7c

SEWER INADEQUACY SUMMARY — TRANSPORT SYSTEM

OUTFALL NO.	DIST. NO.	TOTAL MILES SEWER INVES.	TOTAL MILES INAD. SEWER	TOTAL COST MILLION $	MILES SEWER 99-85% ADEQ.	COST TO CORRECT MILLION $	MILES SEWER 85-70% ADEQ.	COST TO CORRECT MILLION $	MILES SEWER 70-55% ADEQ.	COST TO CORRECT MILLION $	MILES SEWER 55-40% ADEQ.	COST TO CORRECT MILLION $	MILES SEWER 40% ADEQ.	COST TO CORRECT MILLION $
52	521	0.40	0.36	1.055	-	-	-	-	0.25	0.750	0.11	0.305	-	-
	522	1.47	0.96	1.461	-	-	0.30	0.440	0.13	0.189	0.36	0.569	0.17	0.263
	523	0.94	0.94	1.276	0.16	0.150	-	-	0.52	0.679	0.13	0.173	0.13	0.274
	524	1.43	1.43	1.364	-	-	0.19	0.149	0.28	0.265	0.36	0.358	0.60	0.592
Outfall Total		4.24	3.69	5.156	0.16	0.150	0.49	0.589	1.18	1.883	0.96	1.405	0.90	1.129
53 Outfall Total		0.62	0.25	0.340	0.17	0.240	0.08	0.100	-	-	-	-	-	-
		0.62	0.25	0.340	0.17	0.240	0.08	0.100	-	-	-	-	-	-
54 Outfall Total		2.96	1.23	1.141	0.24	0.184	0.40	0.356	0.42	0.413	0.17	0.188	-	-
		2.96	1.23	1.141	0.24	0.184	0.40	0.356	0.42	0.413	0.17	0.188	-	-
Interconnected system	352	2.71	-	-	-	-	-	-	-	-	-	-	-	-
See notes 2 & 3	363	2.93	0.93	1.272	-	-	0.21	0.322	0.51	0.713	0.21	0.237	-	-
	372	1.52												
	374	6.30	0.69	0.724	0.42	0.451	-	-	0.27	0.273	-	-	-	-
	770	3.75	2.69	2.786	0.46	0.244	0.53	0.514	1.15	1.316	0.31	0.436	0.24	0.276
*Interconnected System Partial		17.21	4.31	4.782	0.88	0.695	0.74	0.836	1.93	2.302	0.52	0.673	0.24	0.276
Grand Total		106.48	51.20	75,803	7.04	5,091	12.66	16.282	13.26	26.497	10.63	18.702	7.61	9.231

Notes:

1. Outfalls 15, 17, 23, 25, 31, 32, 33, 41, 50 are minor outlets with minor flow.
2. Outfalls 26, 27, 28, 30, 34, 35, 36 & 37 are part of the interconnected system which will be the subject of a separate special study.
3. Outfalls 35, 36, 37 - A review was made of only the upstream districts of these outfalls which are part of the interconnected system.
4. Outfall 47 is presently sealed.

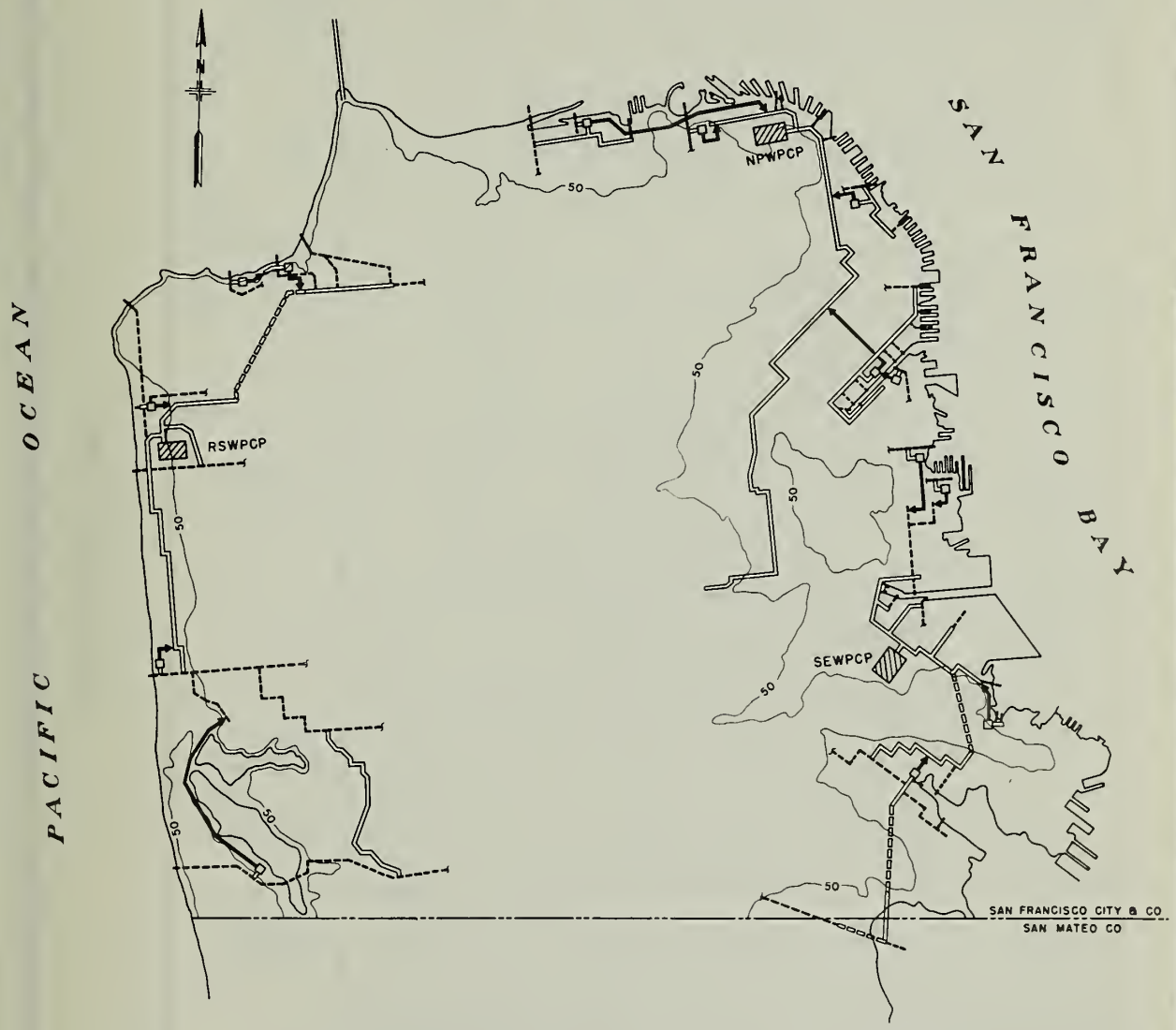
PLATE IV-7D

OUTLET TRANSPORT VELOCITIES

OUTFALLS	No.	X-SEC. AREA (s.f.)	CON-TROL SLOPE	CAP. (c.f.s.)	VELO-CITY
Richmond-Sunset District					
Lake Merced	11	95.0	.002	990	10.4
Vicente	12	39.2	.0136	640	16.3
Lincoln Way	13	106.5	.0063	1300	12.2
Mile Rock	14	80.7	.0061	1580	19.58
Sea Cliff P.S. #1	15	1.8	-	-	-
Sea Cliff	16	28.3	.66	1500	53.0
Sea Cliff P.S. #2	17	0.8	-	-	-
Baker's Beach	18	38.5	.003	110	2.86
(Weighted Avg. Velocity)					24.01
North Point District					
Baker Street	20	63.4	.0078	1100	17.35
Pierce	21	50.3	.0020	290	5.77
Laguna	22	28.3	.033	765	27.00
Hyde	23	3.1	--	--	--
Beach	24	41.1	.0065	440	10.71
Outfalls 25-28 interconnected					
Howard	29	38.5	.0013	280	7.27
Outfalls 30-39 interconnected					
(Weighted Avg. Velocity)					16.75
Southeast Collection System					
Mariposa	40	28.3	.0041	280	9.89
20th St. (Beth.Shipyd-flow unk.)	41	3.1	--	--	--
North Side Third St.	42	14.0	.001	52	3.71
Marin	43	74.7	.00159	600	8.03
Selby	44	209.1	.00178	1800	8.90
Rankin	45	19.6	.009	80	4.08
South Side Third St.	46	7.3	.0069	170	23.29
Mendell (outfall not in use)	47	12.6	--	--	--
Evans	48	28.3	.00154	170	6.01
Hudson	49	4.9	.0393	79.5	16.22
Griffith North	50	2.4	--	--	--
Griffith South	51	23.8	.0045	240	10.08
Yosemite	52	69.6	.003	1260	18.10
Fitch	53	35.8	.00064	150	4.19
Sunnydale	54	33.2	.00184	230	6.93
(Weighted Avg. Velocity)					11.32

CITY & COUNTY OF SAN FRANCISCO

LOCATIONS OF INTERCEPTING SEWERS AND PUMP STATIONS



LEGEND

- INTERCEPTING SEWERS
- SEWER TUNNELS
- SEWER MAINS
- TREATMENT PLANTS
- PUMP STATIONS
- FORCE MAINS

DRAWN BY: Y.D.K DATE 5-17-71 DSE 71-536

PUMP STATIONS - GENERAL INFORMATION

Number	Station	District	Dry Weather Drainage Area (Acres)	Rated Capacity (M.G.D.)	Average Dry Weather Flow Pumped (M.G.D.)	M.G. Pumped 1969 - 1970	Alarm Device	Wet Weather Drainage Area (Acres)	Future Wet Weather			Present Value (Thousands of $)	Future Average Dry Weather Flow (by 1990) M.G.D.
									Estimated Capacity	Estimated Cost (Thousands of $)	Status W. W.		
1	Lake Merced	Richmond-Sunset	1,134	6.77	1.195	625	Yes	2,025	7.1	270	Enlarge	275	1.410
2	Park Merced	Richmond-Sunset	Not in service. Stand-by for Lake Merced P.S.						-	-	-	-	-
3	Vicente	Richmond-Sunset	385	1.29	.1520	62	Yes	1,465	9.1	350	Replace	100	.1540
4	Pine Lake	Richmond-Sunset	19	.20	.0132	6	Yes	60	-	-		35	.0153
5	Fulton	Richmond-Sunset	100	1.16	.2193	106	Yes	100	19.5	680	Replace	94	.2210
6	Sea Cliff #1	Richmond-Sunset	3	.78	.05	5	Yes	3	4.5	410	Eliminate	84	.435
7	Sea Cliff #2	Richmond-Sunset	304	.90	.334	137	Yes	530			Eliminate	78	
8	Richmond-Sunset (T.P.)	Richmond-Sunset	3,780	33.0	10.0	3,639	-	8,006				800	23.000
9	Marina	North Point	1,948	16.15	6.336	2,512	Yes	1,125	20.8	650	Enlarge	580	7.750
10	Hyde	North Point	4.2	.65	.1864	80	Yes	33.6			Eliminate	68	0.255
11	Drumm	North Point	276	12.36	4.040	1,603	Yes	462			Replace	400	6.500
12	4th St. N. of Channel	North Point	784	16.75	6.460	2,975	Yes	5,280	No future plans			580	11.640
13	4th St. S. of Channel	North Point	19	-	.1971	83	Yes	19	No future plans			48	.231
14	Palace of Fine Arts	North Point	2	.325	-	29	-		No future plans			2,100	Negligible
15	North Point (T.P.)	North Point	7,516	190	60.0	23,495	-	7,350	201.0				70.000
16	Mariposa (S.E.)	Southeast	125	1.55	.4275	225	-	220	9.7	360	Enlarge	113	.540
17	20th Street	Southeast	51	0.78	.200	85	Yes	9	1.3	240	Enlarge	70	.235
18	Tennessee St.	Southeast	2.4	2.16	.0318	21	Yes	15	No future plans		No plans	100	.0335
19	Hunters Point	Southeast	21	1.74	.3285	141	-	64	2.6	270	Replace	120	.405
20	Yosemite	Southeast	1,274	12.27	4.830	2,054	Yes	2,085	53.2	1,300	Enlarge	460	6.300
21	Southeast (T.P.)	Southeast	7,494	70	19.0	6,899	Yes	8,946	342.0	-		1,200	22.000
22	S.E. Booster Pump Station	Southeast	-	70	-	-	-	-	-	-		1,200	-

PLATE IV-10A

PUMP STATIONS
PRESENT OPERATING DEFICIENCIES

No.	Station	District	Description of Deficiencies	Improvements Cost
3	Vicente	Richmond-Sunset	Need of standby power	$ 5,000
4	Pine Lake	Richmond-Sunset	Inadequate float control	1,000
5	Fulton	Richmond-Sunset	Main influent valve & ventilation	7,000
6	Sea Cliff 1	Richmond-Sunset	Need if standby power and easy access facilities	10,000
7	Sea Cliff 2	Richmond-Sunset	-Inadequate influent pipe & gate -Need standby power and control valve -Non-standard electrical switching gears -General maintenance	12,000
9	Marina	North Point	Inadequate switching gears Poor lighting and ventilation Need flow diversion	20,000
10	Hyde	North Point	Inadequate influent pipe and float control Inadequate capacity Need of standby power Need of standard electrical switching gear components General Maintenance	42,000
11	Drumm	North Point	Non-standard electrical switching gear General maintenance problems Need of easy access facilities General safety	12,000
13	4th St. S.of Channel	North Point	Non-standard electrical switching gear Inadequate capacity General maintenance problems	7,000
14	Palace of Fine Arts	North Point	Inadequate pump capacity	$ 5,000
16	Mariposa	Southeast	Need of standard type of switching gear Standby power Ventilation and lighting General maintenance	14,000
17	20th St.	Southeast	Inadequate force main Miscellaneous mechanical	7,000
18	Tennessee Street	Southeast	Inadequate capacity	5,000
19	Hunter's Point	Southeast	Standby power Influent pipe Float controls Miscellaneous mechanical deficiencies	27,000
20	Yosemite	Southeast	Need of standby power Inadequate influent pipe and bar racks Float controls and miscellaneous mechanical deficiencies	38,000
			Total	$212,000

NORTH POINT WATER POLLUTION CONTROL PLANT

FLOW DIAGRAM

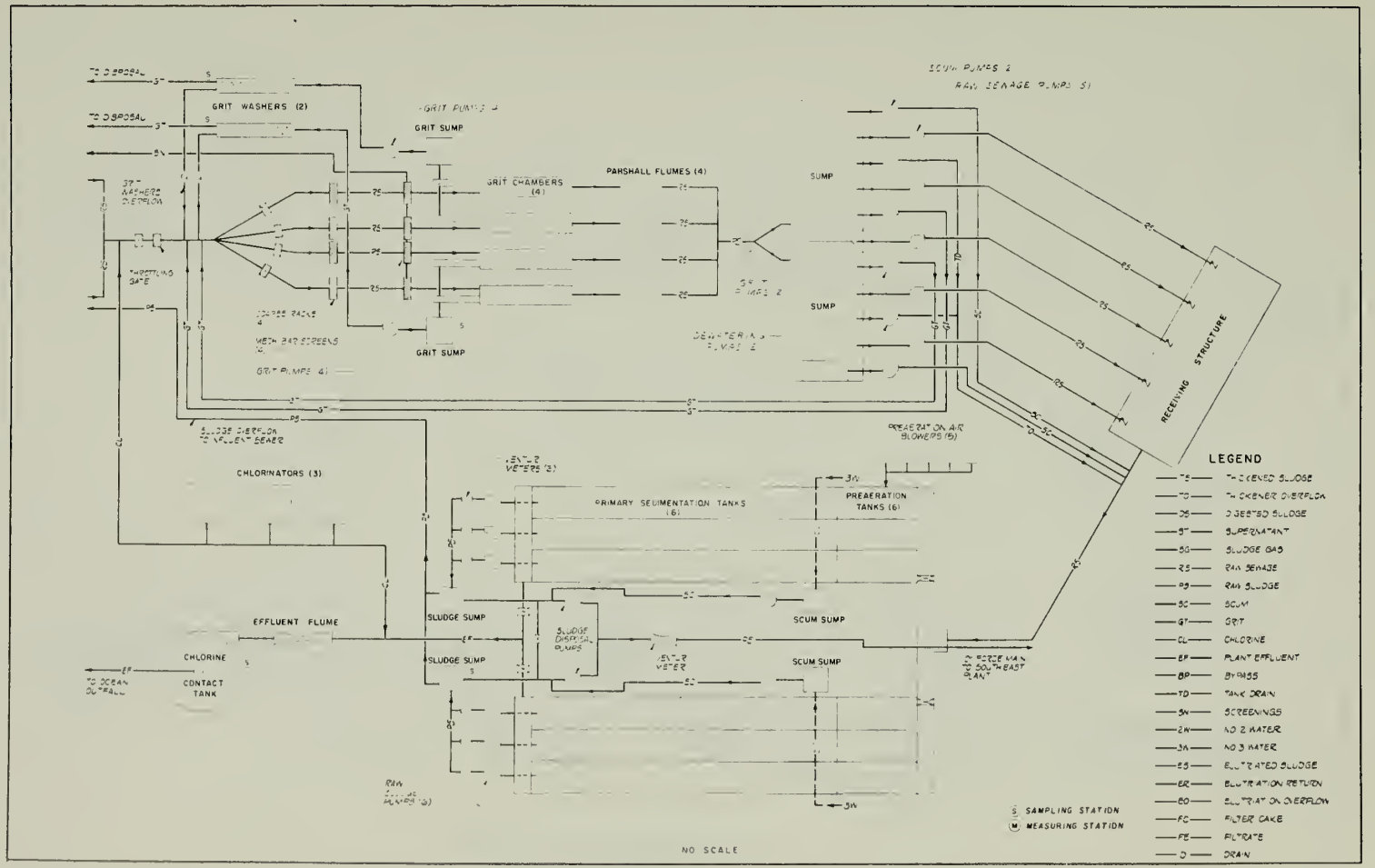
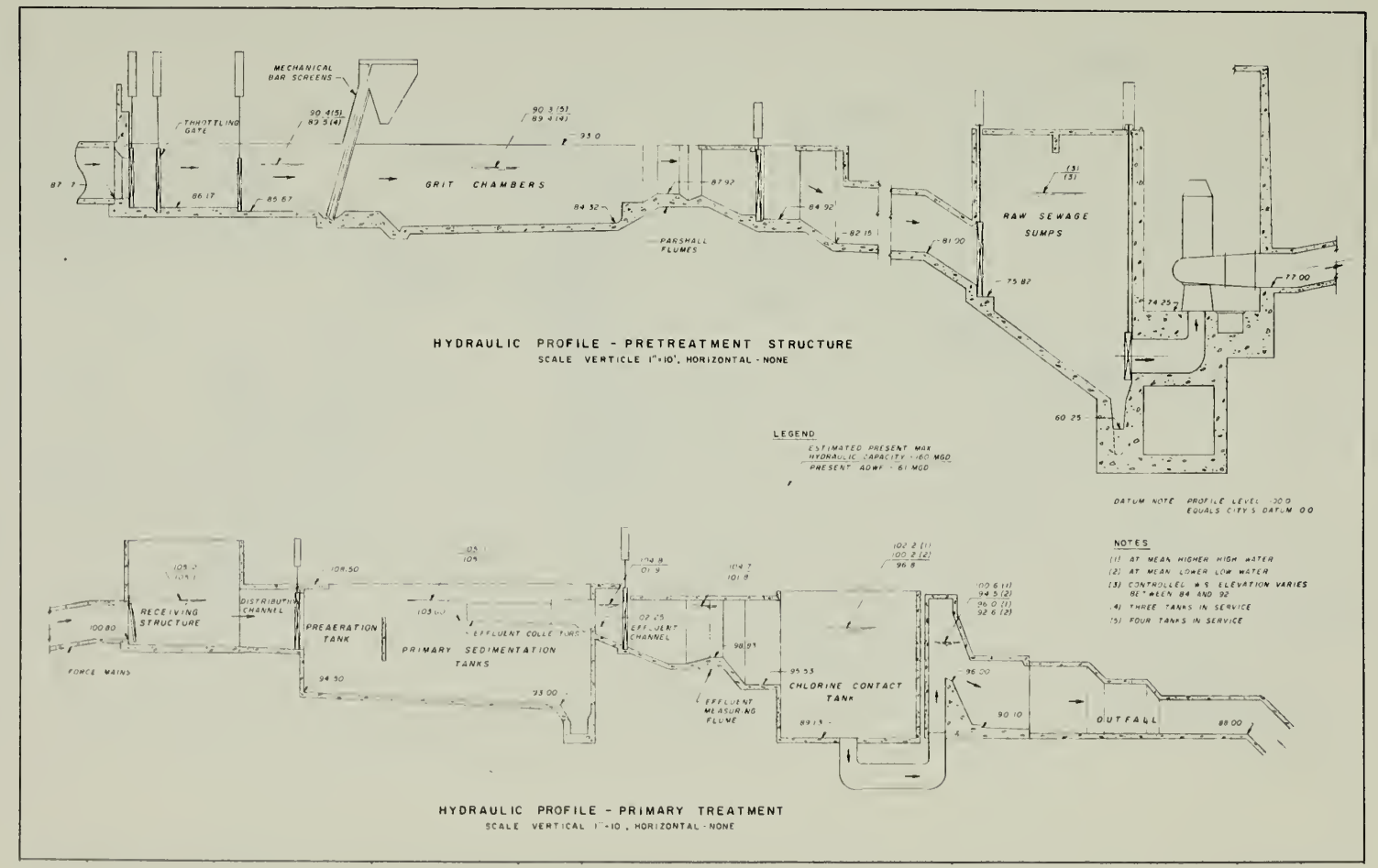


PLATE IV-11

NORTH POINT WATER POLLUTION CONTROL PLANT

HYDRAULIC PROFILES



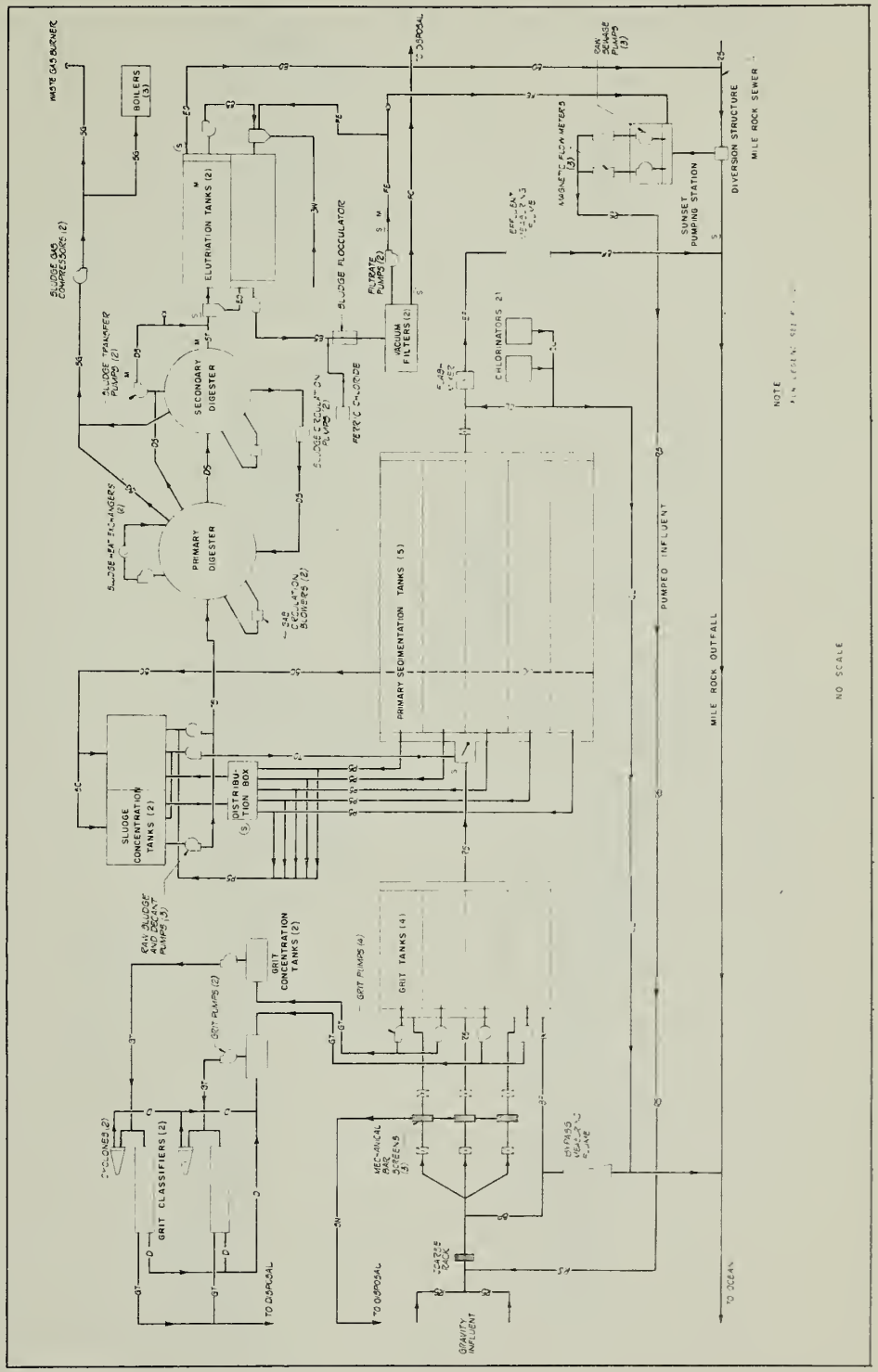
HYDRAULIC PROFILE - PRETREATMENT STRUCTURE
SCALE VERTICLE 1"=10', HORIZONTAL - NONE

HYDRAULIC PROFILE - PRIMARY TREATMENT
SCALE VERTICAL 1"=10, HORIZONTAL - NONE

PLATE IV-12

RICHMOND-SUNSET WATER POLLUTION CONTROL PLANT

FLOW DIAGRAM



RICHMOND-SUNSET WATER POLLUTION CONTROL PLANT

HYDRAULIC PROFILES

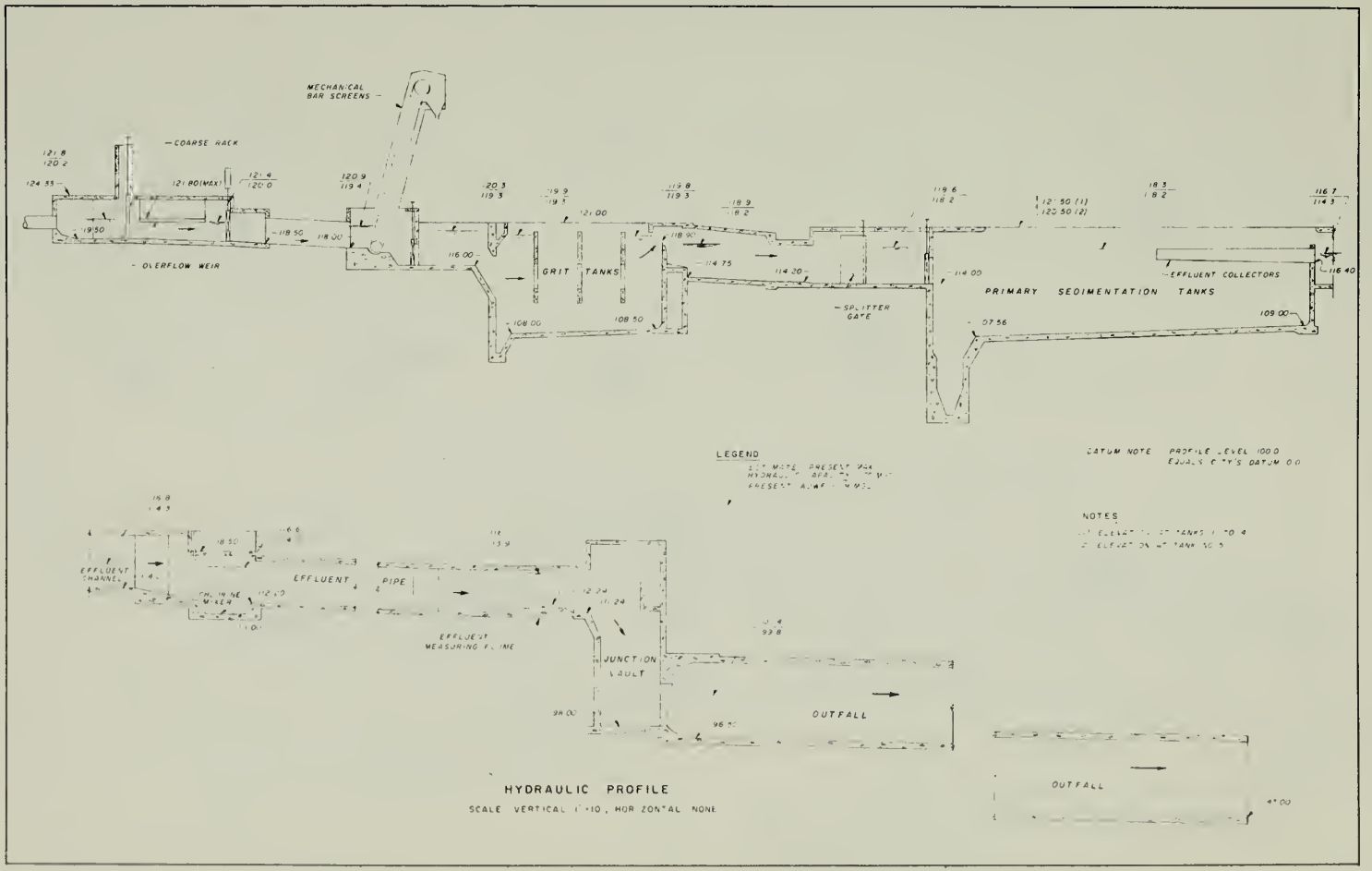
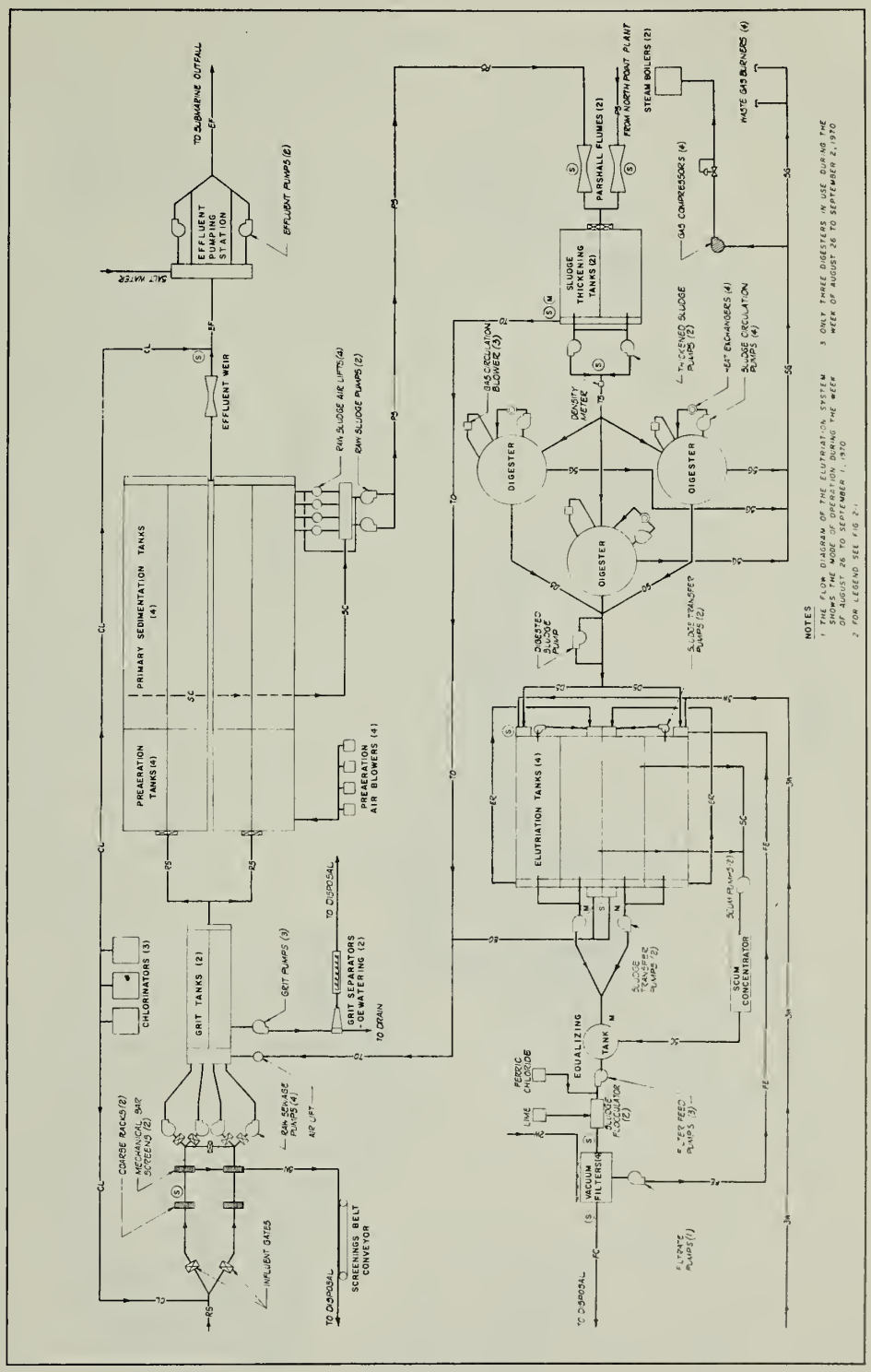


PLATE IV-14

SOUTHEAST WATER POLLUTION CONTROL PLANT

FLOW DIAGRAM



SOUTHEAST WATER POLLUTION CONTROL PLANT

HYDRAULIC PROFILES

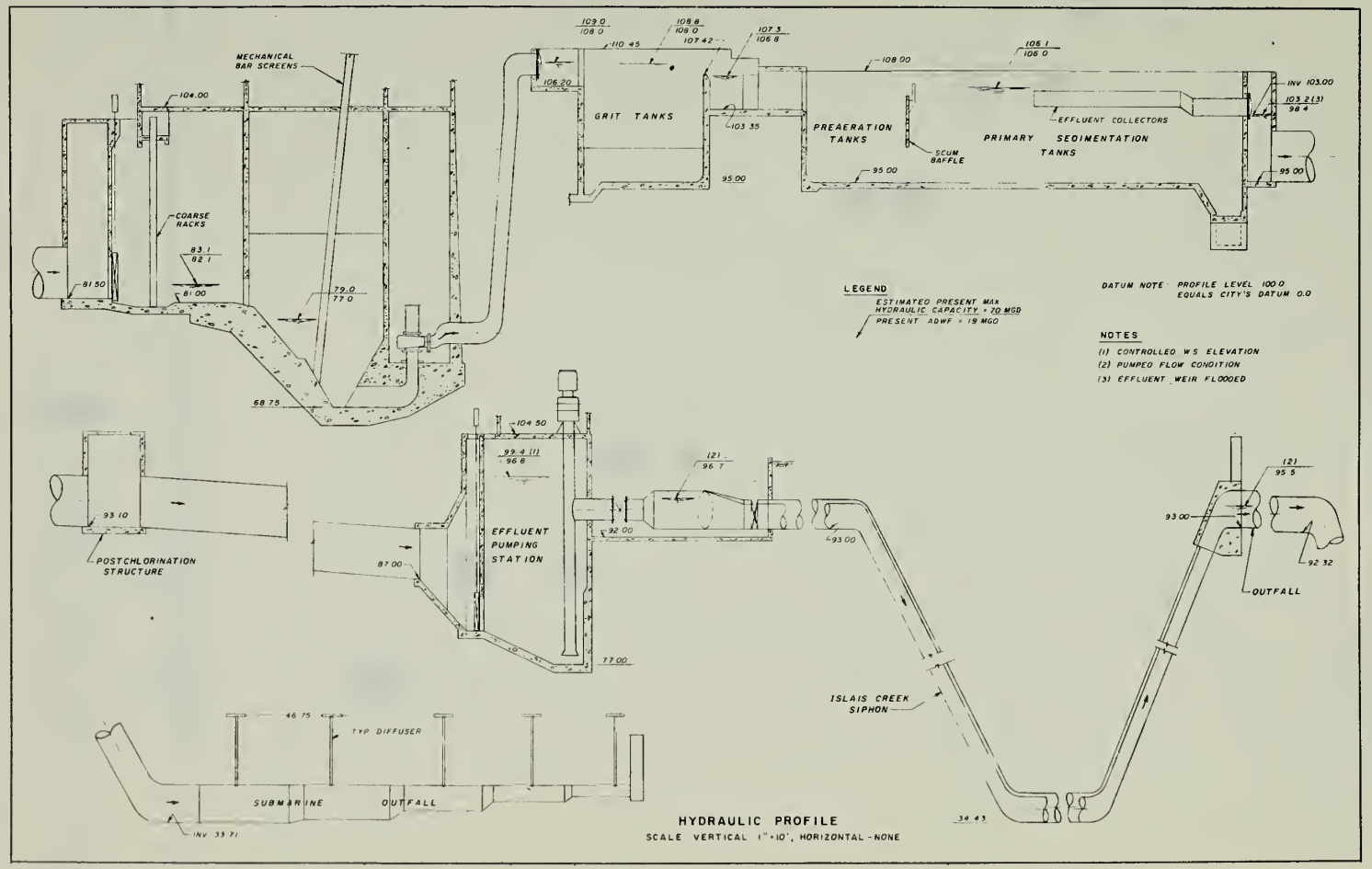
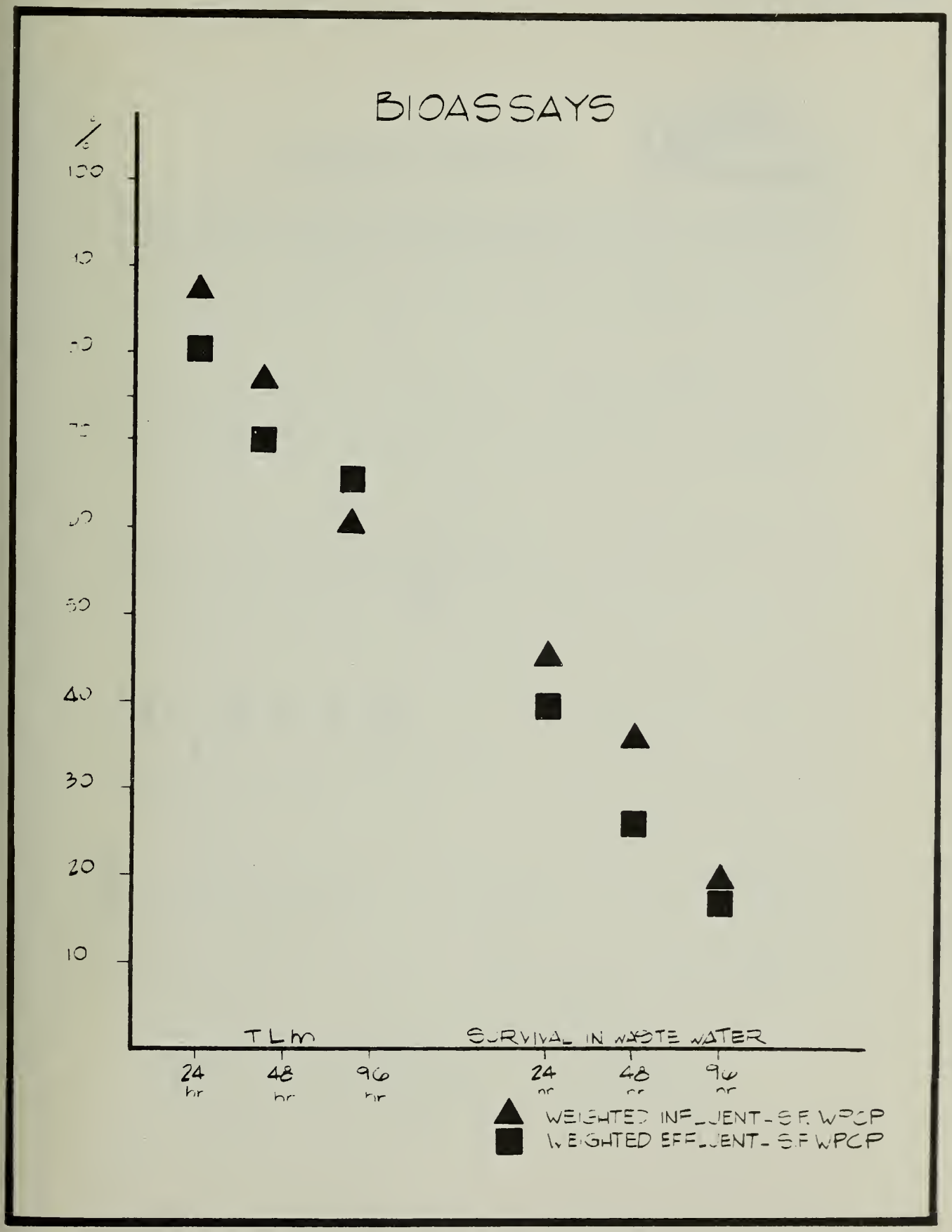
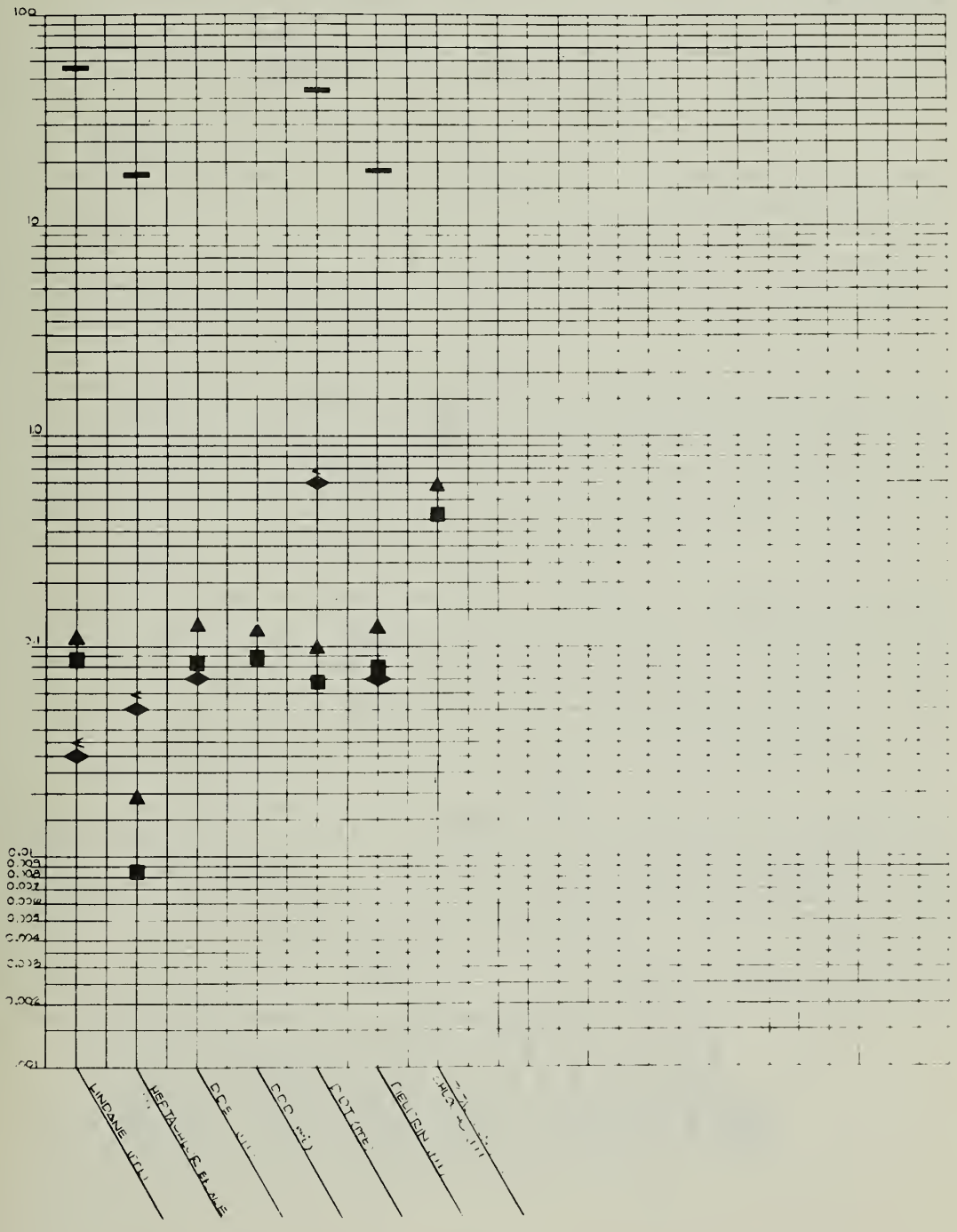


PLATE IV-16


BIOASSAYS
%
100
10
50
40
30
20
10
TLm
SURVIVAL IN WASTE WATER
24 hr
48 hr
96 hr
24 hr
48 hr
96 hr
WEIGHTED INFLUENT - S.F. WPCP
WEIGHTED EFFLUENT - S.F. WPCP

CHLORINATED HYDROCARBONS

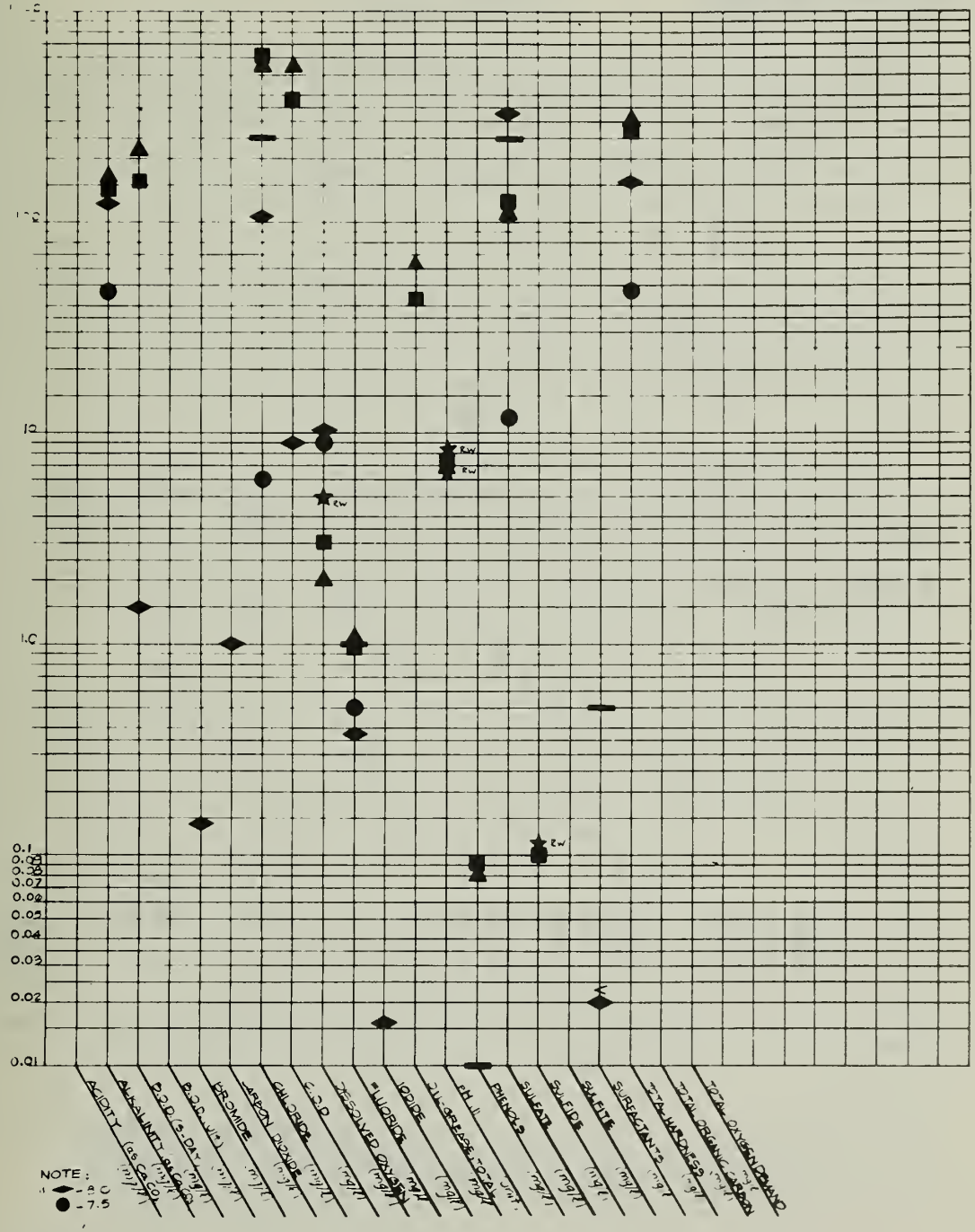
SYMBOLS
- WEIGHTED NF. EFFLUENT S.F. W.P.P.
- WEIGHTED EFFLUENT S.F. W.P.P.
- DRINKING WATER, AVE S.F.
- < LESS THAN
- DRINKING WATER, LOS ANGELES M&O
- U.S.P.H.S. DRINKING WATER STD.
- CALIF. STD. - RECEIVING WATER
- EFFLUENT STREAM



CHEMICAL AND BIOCHEMICAL

SYMBOLS

- ▲ WEIGHTED INFLUENT - S = W.P.C.P.
- ■ WEIGHTED EFFLUENT - S.P. W.P.C.P.
- ● DRINKING WATER, AVE. S.F.
- ◆ DRINKING WATER, LOS ANGELES M.W.D.
- ▬ U.S.P.H.S. DRINKING WATER STD.
- < LESS THAN
- ★ R.W.Q.C.B. STD. - {R.W. - RECEIVING WATER / E - EFFLUENT STREAM



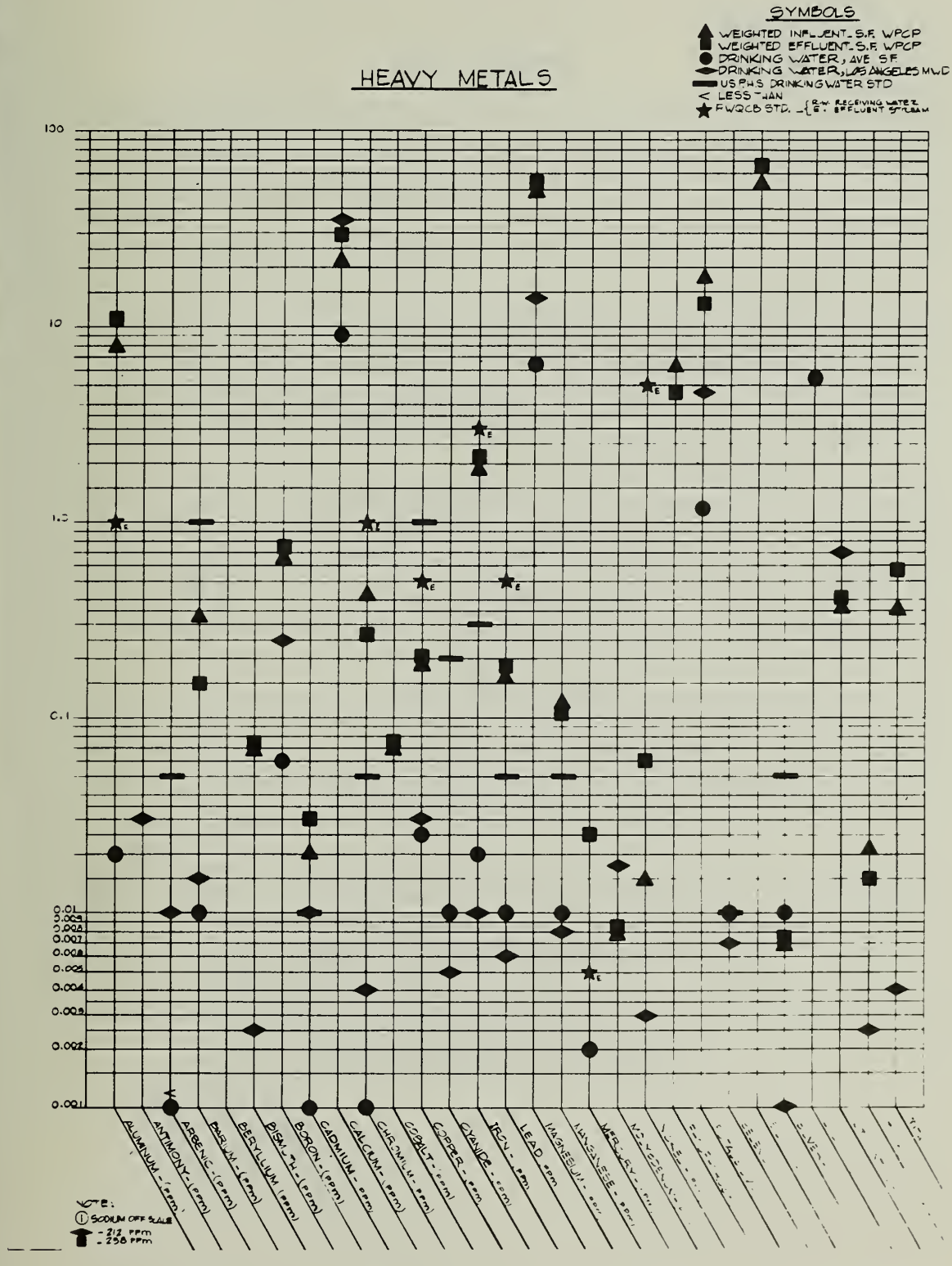

HEAVY METALS
SYMBOLS
WEIGHTED INFLUENT - S.F. WPCP
WEIGHTED EFFLUENT - S.F. WPCP
DRINKING WATER, AVE S.F.
DRINKING WATER, LOS ANGELES M.W.D.
U.S.P.H.S. DRINKING WATER STD
< LESS THAN
F.W.Q.C.B. STD. - {R = RECEIVING WATER, E = EFFLUENT STREAM
100
10
1.0
0.1
0.01
0.009
0.008
0.007
0.006
0.005
0.004
0.003
0.002
0.001
ALUMINUM - (PPM)
ANTIMONY - (PPM)
ARSENIC - (PPM)
BARIUM - (PPM)
BERYLLIUM - (PPM)
BISMUTH - (PPM)
BORON - (PPM)
CADMIUM - PPM
CALCIUM - PPM
CHROMIUM - PPM
COBALT - PPM
COPPER - PPM
CYANIDE - PPM
IRON - PPM
LEAD PPM
MAGNESIUM - PPM
MANGANESE - PPM
MERCURY - PPM
MOLYBDENUM - PPM
NICKEL - PPM
SILVER
NOTE:
① SODIUM OFF SCALE
- 213 PPM
- 258 PPM

PLATE IV-20B

HEAVY METALS

SYMBOLS

- ▲ WEIGHTED INFLUENT - S.F. WPCP
- ■ WEIGHTED EFFLUENT - S.F. WPCP
- ● DRINKING WATER, AVE. S.F.
- ◆ DRINKING WATER, LOS ANGELES M.W.D.
- ▬ USPHS DRINKING WATER STD.
- < LESS THAN
- ★ R.W.Q.C.B. STD. - { R. - RECEIVING WATER, E - EFFLUENT STREAM

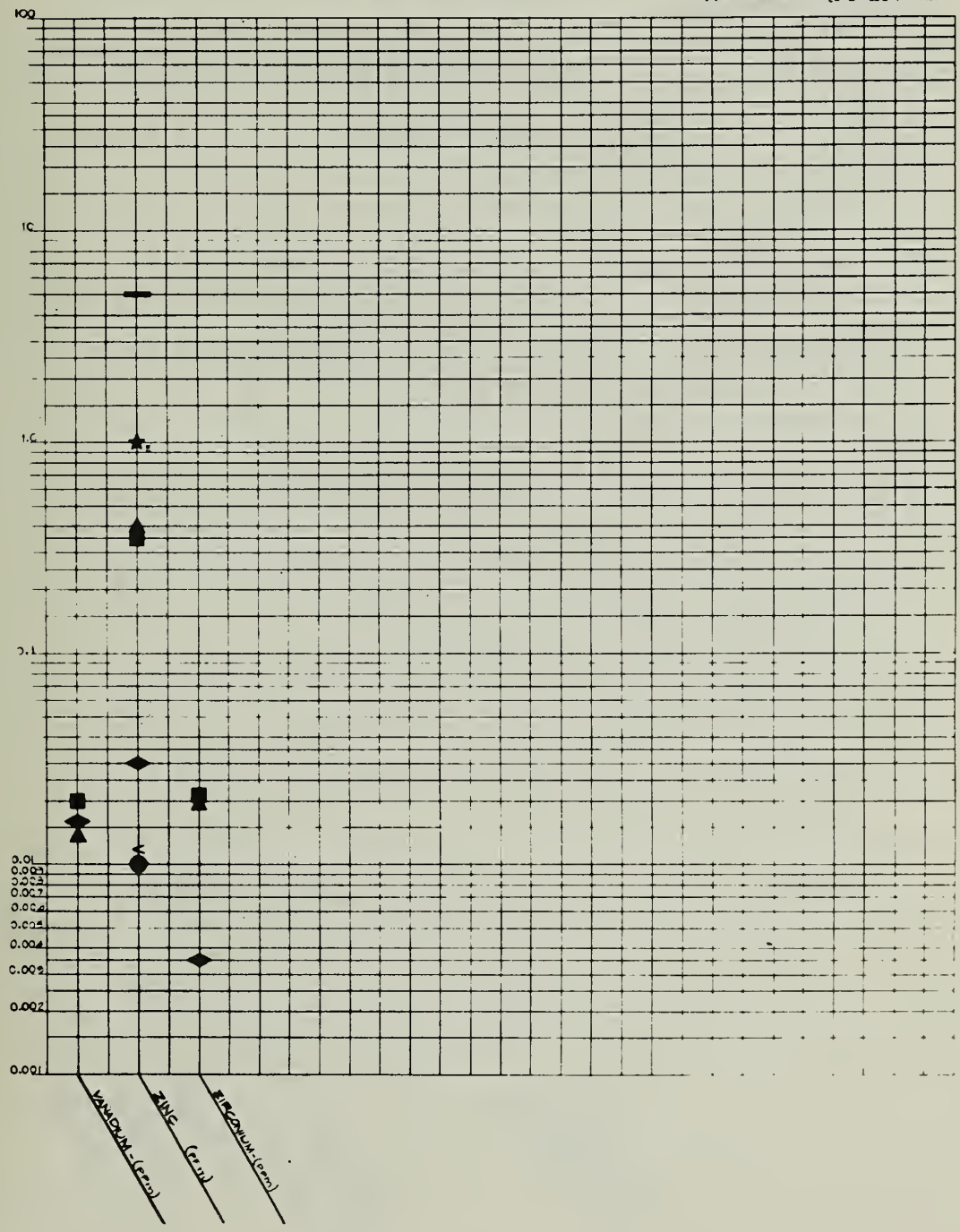


PLATE IV-21

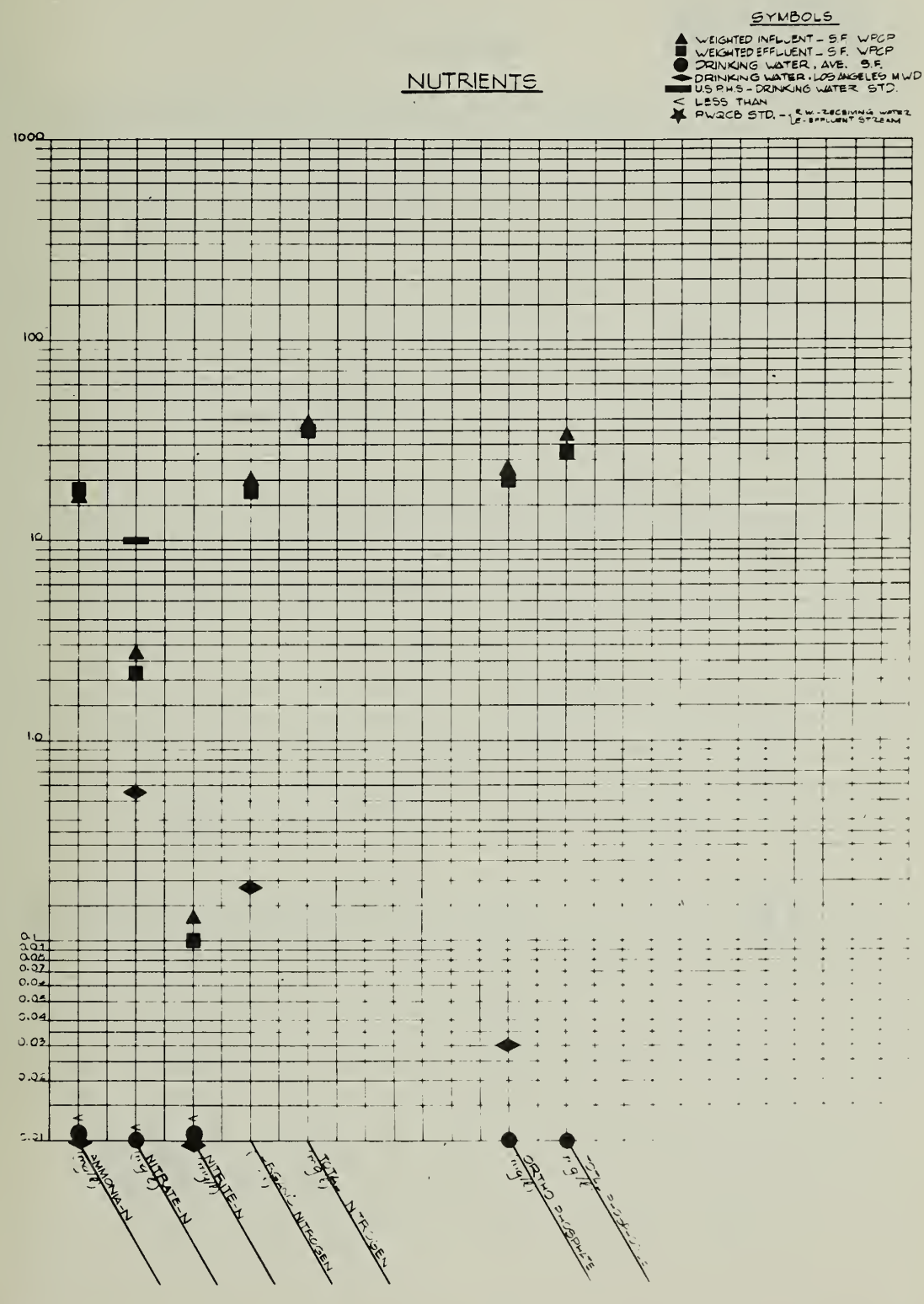
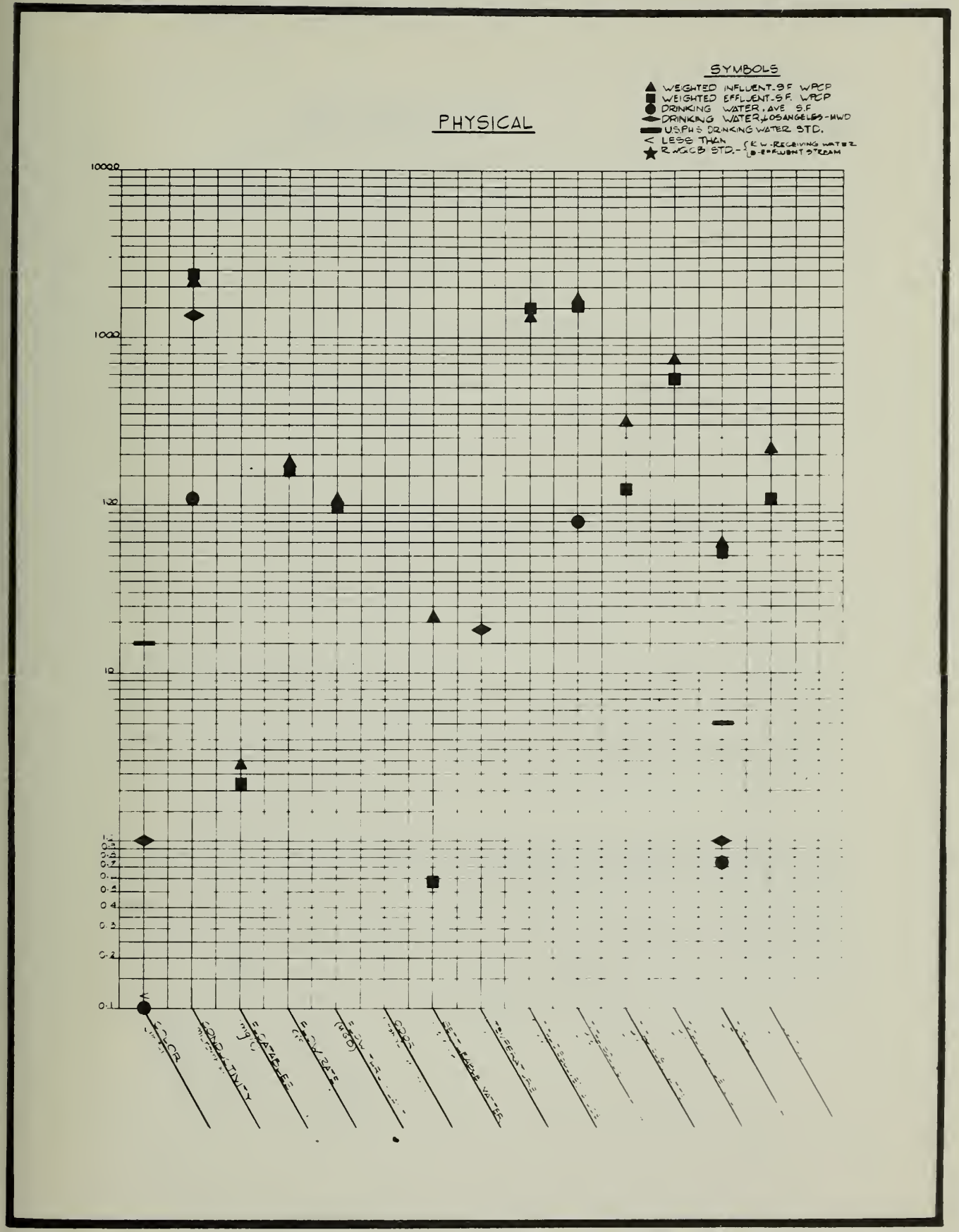

NUTRIENTS
SYMBOLS
WEIGHTED INFLUENT - S.F. WPCP
WEIGHTED EFFLUENT - S.F. WPCP
DRINKING WATER, AVE. S.F.
DRINKING WATER, LOS ANGELES M.W.D.
U.S.P.H.S. - DRINKING WATER STD.
< LESS THAN
RWQCB STD. - R.W.-RECEIVING WATER E.-EFFLUENT STREAM
1000
100
10
1.0
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
AMMONIA-N
NITRATE-N
NITRITE-N
ORGANIC NITROGEN
ORTHO PHOSPHATE

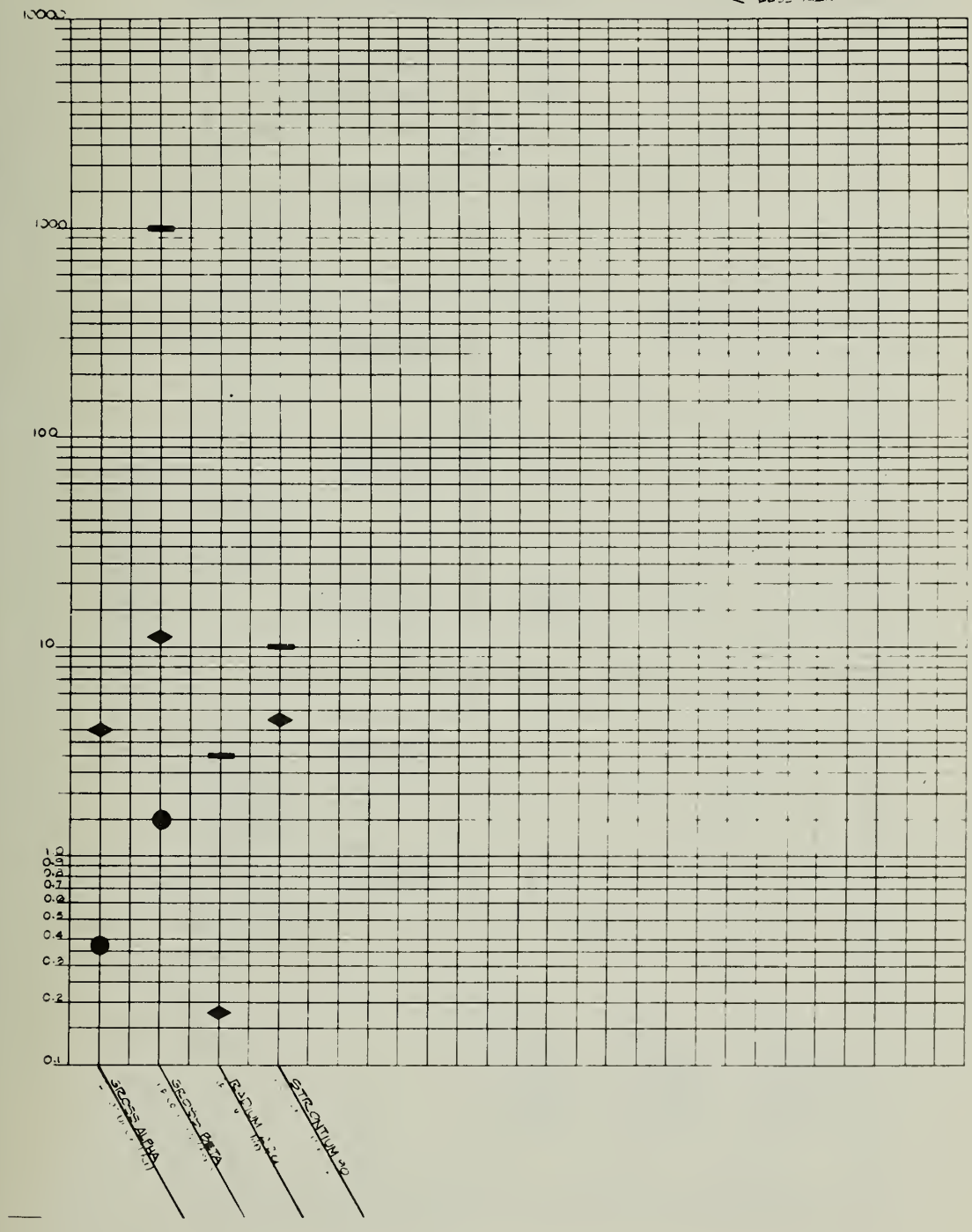
PLATE IV-22


SYMBOLS
WEIGHTED INFLUENT-S.F. WPCP
WEIGHTED EFFLUENT-S.F. WPCP
DRINKING WATER, AVE S.F.
DRINKING WATER, LOS ANGELES-MWD
U.S.P.H.S. DRINKING WATER STD.
< LESS THAN
R.W.Q.C.B. STD.- R-W.-RECEIVING WATER, E-EFFLUENT STREAM
PHYSICAL
10000
1000
100
10
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
COLOR
TURBIDITY
ODOR (T.O.)
SURFACTANTS (MBAS)
SEWAGE WATER

RADIOACTIVE SUBSTANCES

SYMBOLS

- WEIGHTED INFLUENT-SF WRCP
- WEIGHTED EFFLUENT-SF WRCP
- DRINKING WATER, AVG. SF
- DRINKING WATER-LONGBEACH MWD
- U.S.P.H.S. DRINKING WATER STD.
- RWQCB STD - {R.W.-RECEIVING WATER, E.-EFFLUENT STREAM
- < LESS THAN



PLANT DATA
1970 CALENDAR YEAR

PLANT	SUSPENDED SOLIDS		B.O.D.		GREASE		FLOW
	$\frac{10^6 \times \text{lbs.}}{\text{Year}}$	% Removed	$\frac{10^6 \times \text{lbs.}}{\text{Year}}$	% Removed	$\frac{10^6 \times \text{lbs.}}{\text{Year}}$	% Removed	10^3 M.G./Yr.
N.P.W.P.C.P.							
Influent	32.7	59	44.7	34	10.5	47	23.8
Effluent	13.4		29.5		5.6		23.3
R.S.W.P.C.P.							
Influent	9.1	62	11.4	28	2.8	21	7.6
Effluent	3.5		8.2		2.2		7.4
S.E.W.P.C.P.							
Influent	18.5	32	14.2	29	6.8	43	7.3
Effluent	12.6		10.1		3.9		7.6

PLANT DATA
1969-1970 RAINFALL YEAR
(July '69 - June '70)

PLANT	SUSPENDED SOLIDS		B.O.D.		GREASE		FLOW
	$\frac{10^6 \times \text{lbs.}}{\text{Year}}$	% Removed	$\frac{10^6 \times \text{lbs.}}{\text{Year}}$	% Removed	$\frac{10^6 \times \text{lbs.}}{\text{Year}}$	% Removed	10^3 M.G./Yr.
N.P.W.P.C.P.							
Influent	30.7	52	41.6	27	9.5	37	23.5
Effluent	14.8		30.2		6.0		22.9
R.S.W.P.C.P.							
Influent	9.0	63	10.9	28	2.6	19	7.0
Effluent	3.3		7.8		2.1		6.9
S.E.W.P.C.P.							
Influent	21.0	40	13.5	36	6.8	43	6.6
Effluent	12.6		8.7		3.9		7.0

PLANT DATA
AVERAGE MONTHLY DATA
1970 CALENDAR YEAR

PARAMETER	N.P.W.P.C.P.			R.S.W.P.C.P.			S.E.W.P.C.P.		
	DRY(1) WEATHER MONTH	WET(2) WEATHER MONTH	TWELVE MONTH AVERAGE	DRY(1) WEATHER MONTH	WET(2) WEATHER MONTH	TWELVE MONTH AVERAGE	DRY(1) WEATHER MONTH	WET(2) WEATHER MONTH	TWELVE MONTH AVERAGE
	10^6 x Pounds per Month								
SUSPENDED SOLIDS									
Influent	2.6	2.8	2.7	1.6	1.5	1.5	0.80	0.73	0.76
Effluent	1.0	1.1	1.1	0.9	1.1	1.1	0.30	0.29	0.29
B.O.D.									
Influent	3.9	3.6	3.7	1.3	1.1	1.2	0.96	0.96	0.96
Effluent	2.4	2.5	2.5	0.9	0.8	0.8	0.70	0.68	0.69
GREASE									
Influent	0.9	0.9	0.9	0.58	0.55	0.57	0.24	0.22	0.23
Effluent	0.4	0.5	0.5	0.32	0.34	0.33	0.20	0.18	0.19
	Million Gallons per Day								
FLOW									
Influent	59.0	69.5	65.1	(4)			(3)		
Effluent	57.6	68.1	63.6	20.0	21.1	20.7	19.9	20.8	20.4

1) Dry Weather Months are: April, May, July, August, and September 1970.

2) Wet Weather Months are: January, February, March, June, October, November, and December.

3) From Brown and Caldwell report the influent flow is 0.4 MGD greater than the effluent.

4) From Brown and Caldwell report the influent flow is 0.9 MGD less than the effluent.

PLATE IV-26

PLANT DATA
AVERAGE MONTHLY DATA
1969-1970 RAINFALL YEAR

PARAMETER	N.P.W.P.C.P.			R.S.W.P.C.P.			S.E.W.P.C.P.		
	DRY WEATHER MONTH (1)	WET WEATHER MONTH (2)	TWELVE MONTH AVERAGE	DRY WEATHER MONTH (1)	WET WEATHER MONTH (2)	TWELVE MONTH AVERAGE	DRY WEATHER MONTH (1)	WET WEATHER MONTH (2)	TWELVE MONTH AVERAGE
	10^6 x Pounds per Month								
SUSPENDED SOLIDS									
Influent	2.7	2.5	2.6	1.7	1.8	1.7	0.9	0.7	0.75
Effluent	1.2	1.3	1.2	1.0	1.1	1.0	0.3	0.2	0.27
B.O.D.									
Influent	3.7	3.2	3.5	1.2	1.1	1.1	1.0	0.9	0.90
Effluent	2.6	2.5	2.5	0.8	0.7	0.7	0.7	0.6	0.65
GREASE									
Influent	0.9	0.7	0.8	0.6	0.6	0.6	0.24	0.21	0.22
Effluent	0.5	0.5	0.5	0.3	0.3	0.3	0.19	0.16	0.17
	Million Gallons per Day								
FLOW									
Influent	60.3	67.2	64.4	(4)			(3)		
Effluent	58.3	65.8	62.9	18.5	19.5	19.1	19.6	18.3	18.9

1) Dry Weather Months are: July, August, September 1969, and April, May 1970.

2) Wet Weather Months are: October, November, December 1969, and January, February, March, June 1970.

3) From Brown and Caldwell Report the influent flow is 0.4 MGD greater than the effluent.

4) From Brown and Caldwell Report the influent flow is 0.9 MGD less than the effluent.

AVERAGE LOADING DATA
(Supplemental)

CONSTITUENT	NPWPCP	RSWPCP	SEWPCP
FLOW (MGD)	59.0	20.2	19.2
FLOATABLES (10^3 lb/day)			
Influent	1.6	0.52	0.54
Effluent	1.2	0.39	0.36
TOTAL NITROGEN (10^3 lb/day)			
Influent	17	6.3	7.9
Effluent	15	5.9	8.9
TOTAL PHOSPHORUS (10^3 lb/day)			
Influent	14	6.0	5.0
Effluent	12	6.3	6.2
T.I.C.H.* (lb/day)			
Influent	0.18	0.11	0.10
Effluent	0.18	0.10	0.07

* Total Identified Chlorinated Hydrocarbons

COMPARISON OF BIOASSAY RESULTS
NORTH POINT, RICHMOND-SUNSET, & SOUTHEAST PLANTS

PLANT	ANALYSIS	INFLUENT 24-HOUR COMPOSITE			EFFLUENT 24-HOUR COMPOSITE		
		MAXIMUM DAY (Percent)	MINIMUM DAY (Percent)	7-DAY AVERAGE (Percent)	MAXIMUM DAY (Percent)	MINIMUM DAY (Percent)	7-DAY AVERAGE (Percent)
N.P.W.P.C.P.	TL_m^{96}	100^+	47	76	100^+	50	77
	96-hour Survival	80	0	21	90	0	29
R.S.W.P.C.P.	TL_m^{96}	75	22	47	40	16	23
	96-hour Survival	0	0	0	0	0	0
S.E.W.P.C.P.	TL_m^{96}	100^+	63	82	80	63	68
	96-hour Survival	90	0	38	0	0	0

PLATE IV-29

TREATMENT PLANT REMOVAL EFFICIENCIES

PLANT	(1) AVERAGE INFLUENT FLOW (M.G.D.)	(1) B.O.D. (%)	(1) S.S. (%)	(1) GREASE (%)	(2) T.N. (%)	(2) T.P. (%)
N.P.W.P.C.P.						
Dry Weather	60.4	29.5	57.4	39.6	11.8	14.3
Wet Weather	67.0	22.0	45.0	30.0	-	-
Annual	64.4	25.4	50.5	34.4	-	-
R.S.W.P.C.P.						
Dry Weather	20.0	28.6	56.0	16.7	6.0	(3)
Wet Weather	18.8	28.4	64.0	21.4	-	-
Annual	19.3	28.4	60.5	19.2	-	-
S.E.W.P.C.P.						
Dry Weather	17.6	34.4	41.9	10.3	(4)	8.0
Wet Weather	18.6	35.1	40.4	35.0	-	-
Annual	18.2	34.8	41.0	24.6	-	-

1) From WPCP data for 1969-1970 Rainfall Year.

2) From Brown & Caldwell Report Tables 3-5, 3-14, and 3-24.

3) Shows an increase of 3%.

4) Shows an increase of 12.7%.

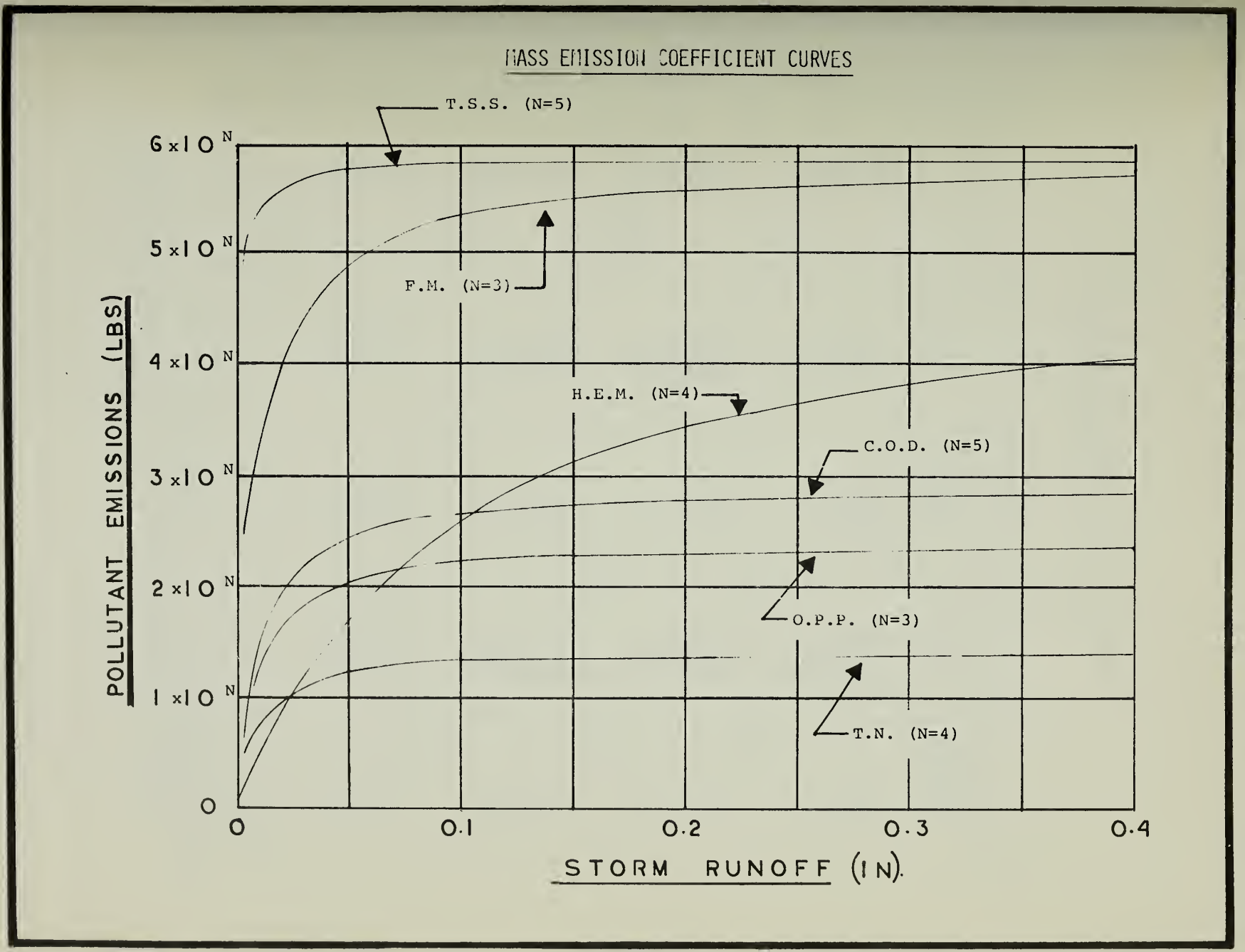

MASS EMISSION COEFFICIENT CURVES
T.S.S. (N=5)
F.M. (N=3)
H.E.M. (N=4)
C.O.D. (N=5)
O.P.P. (N=3)
T.N. (N=4)
POLLUTANT EMISSIONS (LBS)
6 x 10 N
5 x 10 N
4 x 10 N
3 x 10 N
2 x 10 N
1 x 10 N
0
0
0.1
0.2
0.3
0.4
STORM RUNOFF (IN).

PLATE IV-31

COMPARISON OF ANNUAL RAW MASS EMISSIONS

CITY & COUNTY OF SAN FRANCISCO

ZONE	CONSTITUENT	EMISSIONS IN POUNDS X 10^3			
		DRY WEATHER	DUE TO STORM	RAW TOTAL	COMBINE[1] SEWER OVERFLOW
NPWPCP	COD	112,000	5,000	117,000	6,270
	TSS	32,400	12,000	44,400	8,920
	TN	6,200	250	6,450	315
	OPP	5,100	42	5,142	149
	HEM	10,800	485	11,285	584
	FLOATABLES	584	100	684	81
RSWPCP	COD	33,600	4,300	37,900	3,710
	TSS	10,800	10,400	21,200	7,334
	TN	2,300	215	2,515	200
	OPP	2,200	36	2,236	76
	HEM	2,900	420	3,320	354
	FLOATABLES	190	87	277	63.7
SEWPCP	COD	42,000	4,200	46,200	3,620
	TSS	20,400	10,100	30,500	7,346
	TN	2,900	208	3,108	215
	OPP	1,800	34	1,834	61
	HEM	7,200	405	7,605	442
	FLOATABLES	197	83	280	62.6
TOTAL CITY	COD	187,600	13,500	201,100	13,600
	TSS	63,600	32,500	96,100	23,600
	TN	11,400	673	12,073	730
	OPP	9,100	112	9,212	286
	HEM	20,900	1,310	22,210	1,380
	FLOATABLES	971	270	1,241	208
	FLOW	35,900 MG	8,800 MG	44,700 MG	2,500 MG

(1) Calculated as: "Due to Storm Emissions" x % of runoff overflowing ÷ 100
+ "Dry Weather Emissions" x % of time overflowing ÷ 100

Existing Conditions: 68% of total runoff overflows and overflow occurs 2.35% of total year.

COMPARISON OF ANNUAL RAW MASS EMISSIONS

CITY & COUNTY OF SAN FRANCISCO

ZONE	CONSTITUENT	EMISSIONS IN PERCENT			
		DRY WEATHER	DUE TO STORM	RAW TOTAL	COMBINED[1] SEWER OVERFLOW
NPWPCP	COD	95.7	4.3	100	5.4
	TSS	73.0	27.0	100	20.1
	TN	96.1	3.9	100	4.9
	OPP	99.2	0.8	100	2.9
	HEM	95.7	4.3	100	5.2
	FLOATABLES	85.4	14.6	100	11.9
RSWPCP	COD	88.7	11.3	100	9.8
	TSS	50.9	49.1	100	34.6
	TN	91.5	8.5	100	8.0
	OPP	98.4	1.6	100	3.4
	HEM	87.3	12.7	100	10.7
	FLOATABLES	68.6	31.4	100	23.0
SEWPCP	COD	90.9	9.1	100	7.8
	TSS	66.9	33.1	100	24.1
	TN	93.3	6.7	100	6.9
	OPP	98.1	1.9	100	3.3
	HEM	94.7	5.3	100	5.8
	FLOATABLES	70.4	29.6	100	22.1
TOTAL CITY	COD	93.3	6.7	100	6.8
	TSS	66.2	33.8	100	24.6
	TN	94.4	5.6	100	6.0
	OPP	98.8	1.2	100	3.1
	HEM	94.1	5.9	100	6.2
	FLOATABLES	78.2	21.8	100	16.8
	FLOW	35,900 MG	8,800 MG	44,700 MG	7,500 MG

[1] Calculated as: "Due to Storm Emissions" x % of runoff overflowing ÷ 100
+ "Dry Weather Emissions" x % of time overflowing ÷ 100

Existing Conditions: 68% of total runoff overflows and overflow occurs 2.35% of total year.

COMPARISON OF DAILY AVERAGE MASS EMISSIONS

CITY & COUNTY OF SAN FRANCISCO

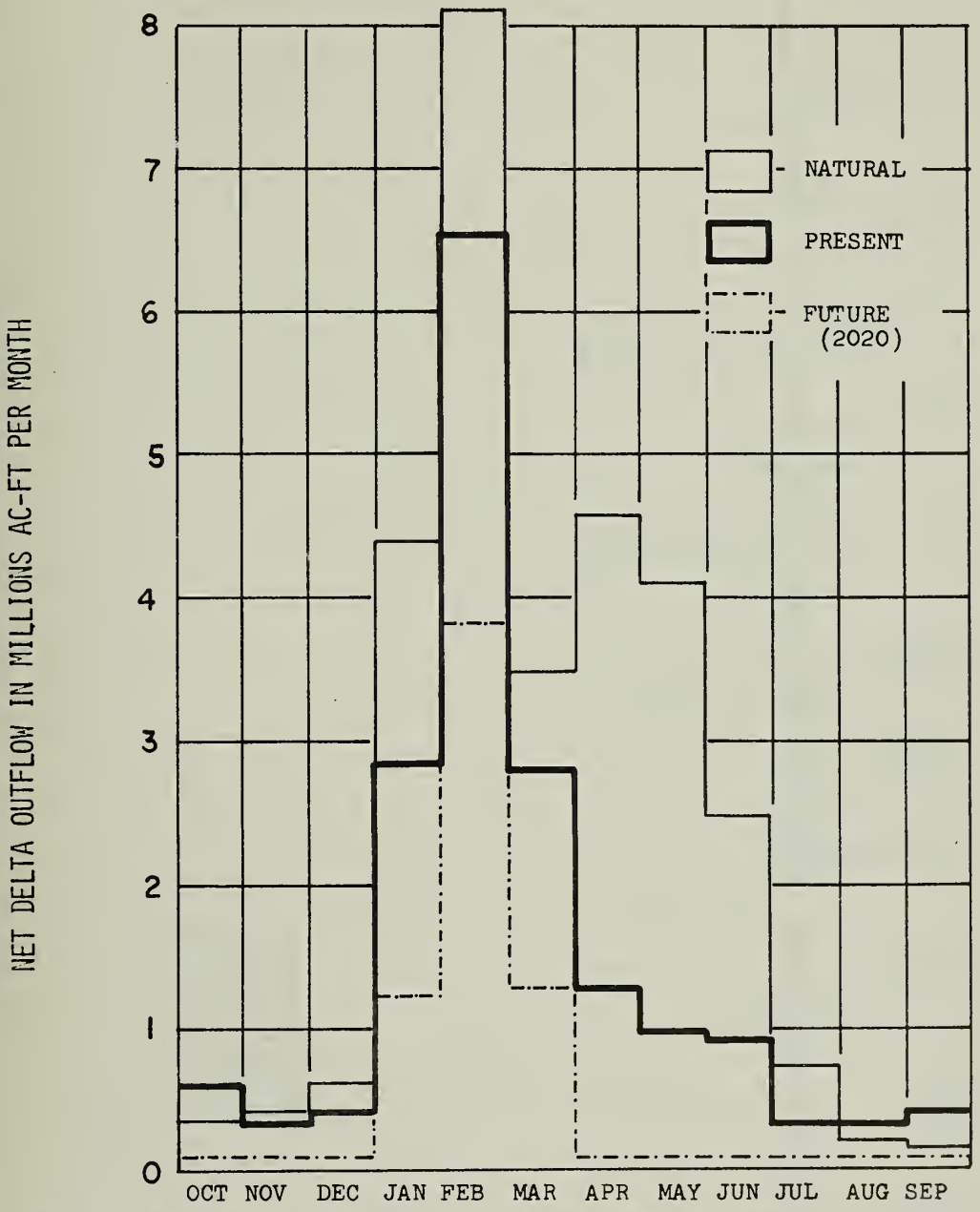
ZONE	CONSTITUENT	EMISSIONS IN POUNDS X 10^3			RATIOS		
		AVG. DRY[1] WEATHER DAY TO TREAT. PLANT I	AVG. WET WEATHER DAY[2] TO TREAT. PLANT II	AVG. WET WEATHER DAY[2] TO OVERFLOW III	II/I	III/I	III/II
NPWPCP	COD	307.0	280.0	136.0	0.91	0.44	0.49
	TSS	89.0	156.0	194.0	1.75	2.18	1.24
	TN	17.0	15.6	6.8	0.92	0.40	0.44
	OPP	14.0	11.7	3.2	0.84	0.23	0.27
	HEM	29.6	27.4	12.7	0.93	0.43	0.46
	FLOATABLES	1.6	2.0	1.8	1.25	1.13	0.90
RSWPCP	COD	92.0	104.0	81.0	1.13	0.88	0.78
	TSS	30.0	97.0	159.0	3.23	5.30	1.64
	TN	6.3	6.7	4.3	1.06	0.68	0.64
	OPP	6.0	5.1	1.7	0.85	0.28	0.33
	HEM	7.9	9.3	7.7	1.18	0.97	0.83
	FLOATABLES	.5	1.0	1.4	2.00	2.80	1.40
SEWPCP	COD	115.0	127.0	79.0	1.10	0.69	0.62
	TSS	56.0	116.0	160.0	2.07	2.86	1.38
	TN	7.9	7.7	4.7	0.97	0.59	0.61
	OPP	4.9	4.3	1.3	0.88	0.27	0.30
	HEM	19.7	18.9	9.6	0.96	0.49	0.51
	FLOATABLES	.5	.9	1.4	1.80	2.80	1.56
TOTAL CITY	COD	514.0	511.0	296.0	0.99	0.58	0.58
	TSS	175.0	369.0	513.0	2.11	2.93	1.39
	TN	31.2	30.0	15.8	0.96	0.51	0.53
	OPP	24.9	21.1	6.2	0.85	0.25	0.29
	HEM	57.2	55.6	30.0	0.97	0.52	0.54
	FLOATABLES	2.6	3.9	4.6	1.50	1.77	1.18

(1) Average dry weather day emissions equals $1/365^{th}$ of annual dry weather emissions.

(2) Average wet weather day emissions to: overflow equals $1/46^{th}$ of combined sewer overflow portion; treatment plant equals the sum of average dry weather day and due to storm emissions 46 and then subtracting (III) from the sum.

AVERAGE YEAR DELTA OUTFLOW: NATURAL, PRESENT AND FUTURE

HYDROLOGIC YEAR 1935-36



Notes: 1. Natural outflow based on DWR estimate. Present and 2020 figures based on data from the USBR and DWR, March 1968.

2. Assuming Delta lowlands water use was the same as it is today.

RICHMOND-SUNSET SEWAGE TREATMENT PLANT COMPLIANCE RECORD

Bacterial Quality - Receiving Water, Occean Beaches

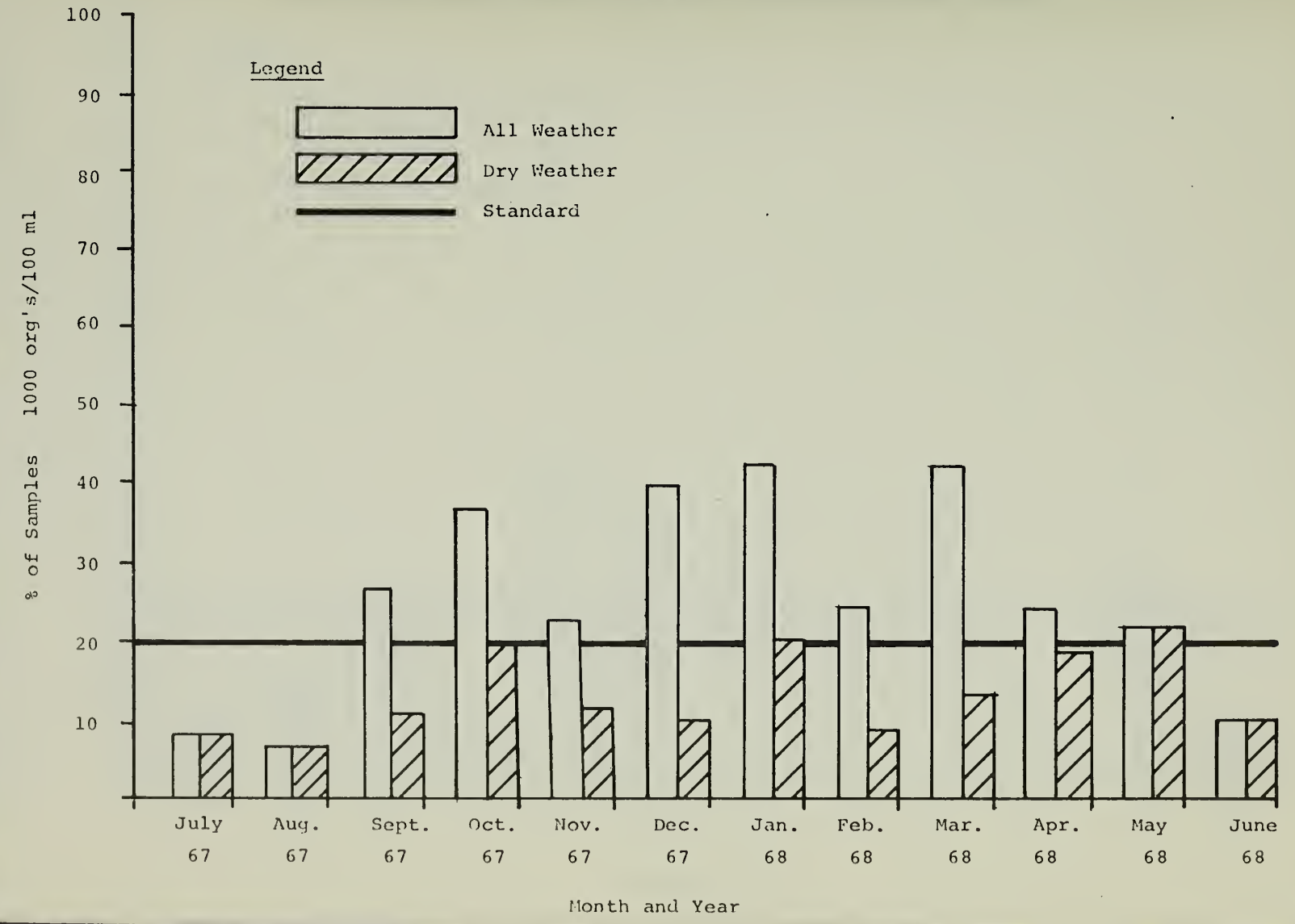


PLATE IV-36

RICHMOND-SUNSET SEWAGE TREATMENT PLANT COMPLIANCE RECORD

Bacterial Quality - Receiving Waters, Phelan and Baker Beaches

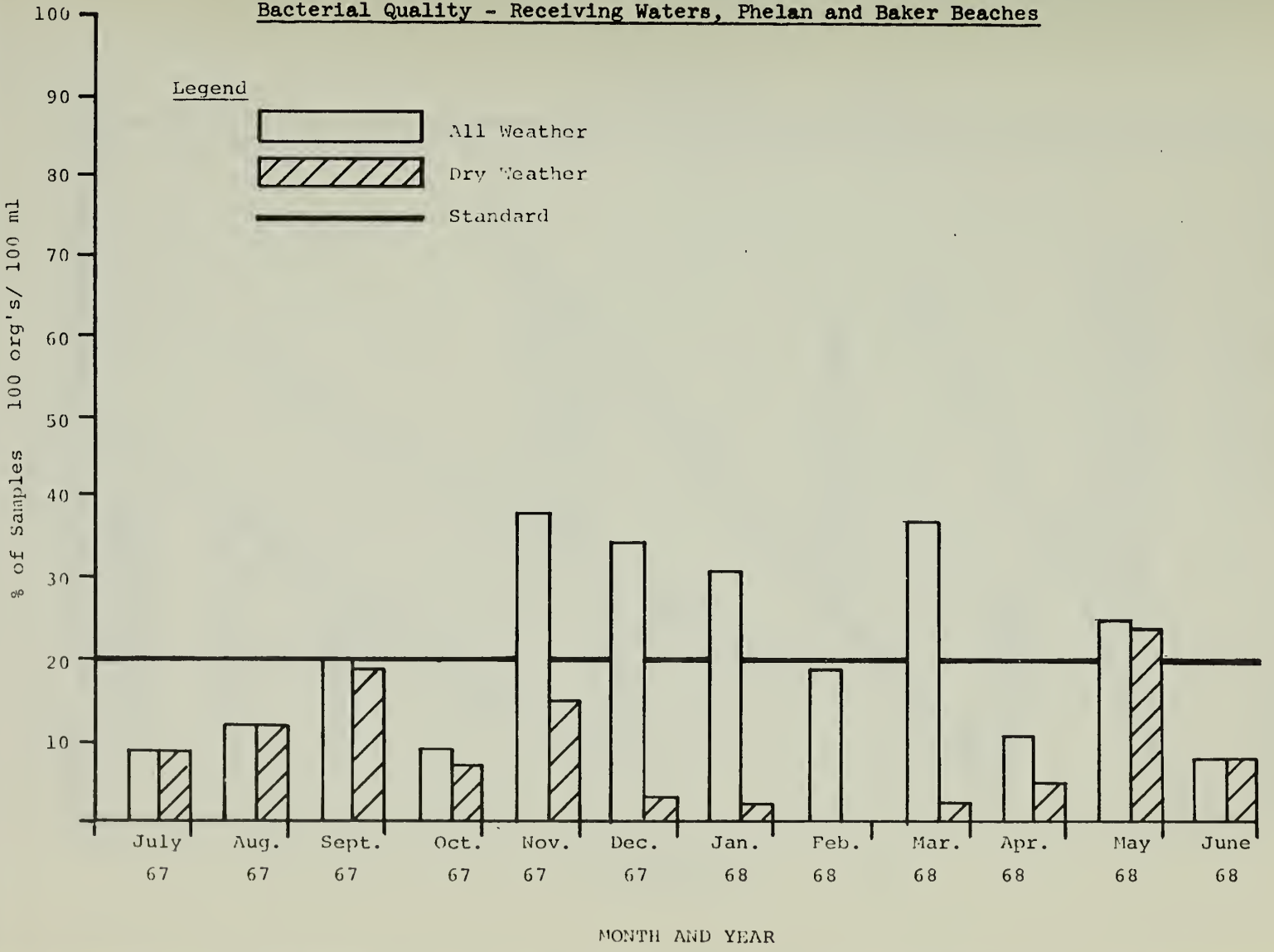
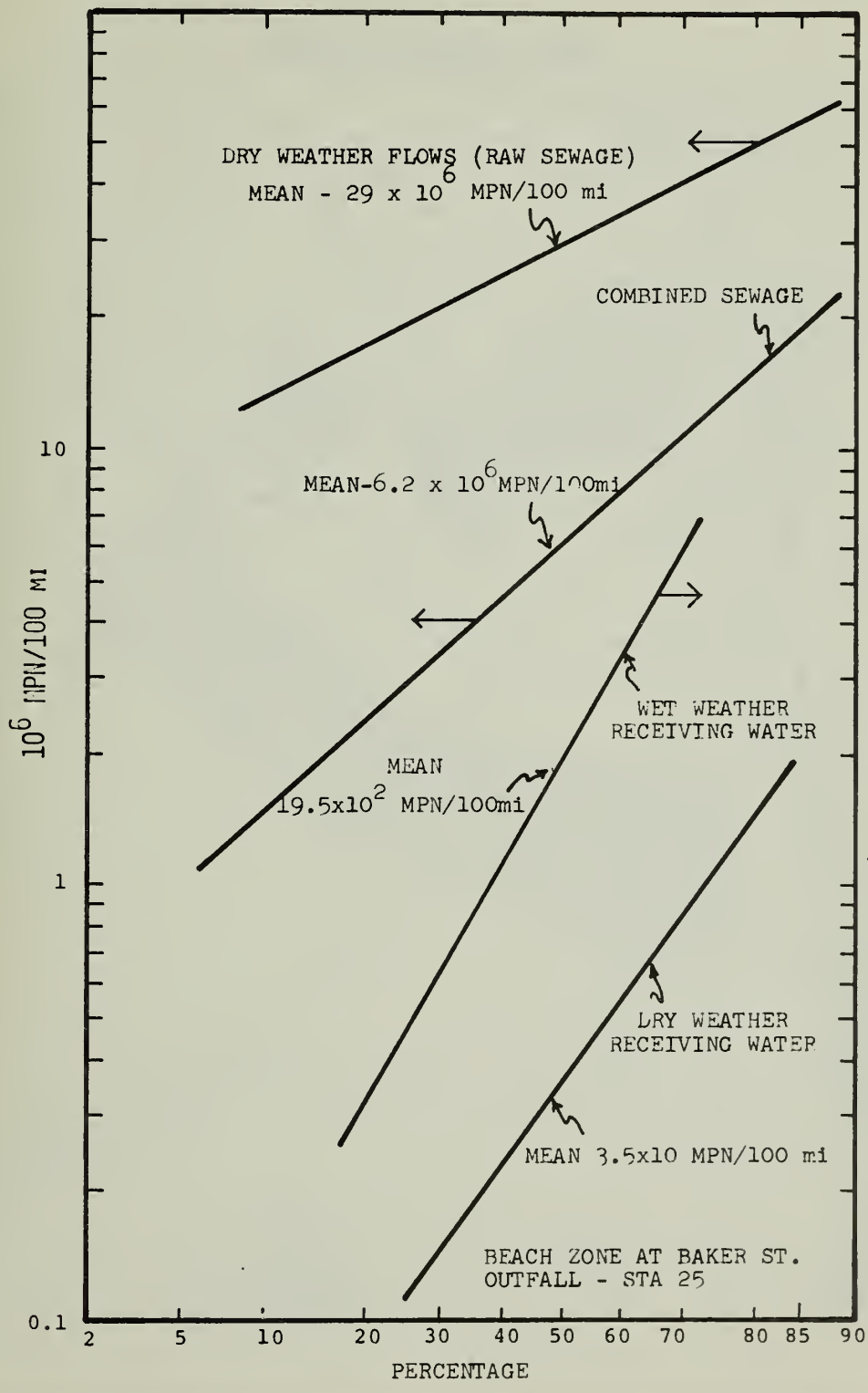


PLATE IV-37

COMPARISON OF COLIFORM MPN LEVELS IN
WASTE STREAMS AND RECEIVING WATERS



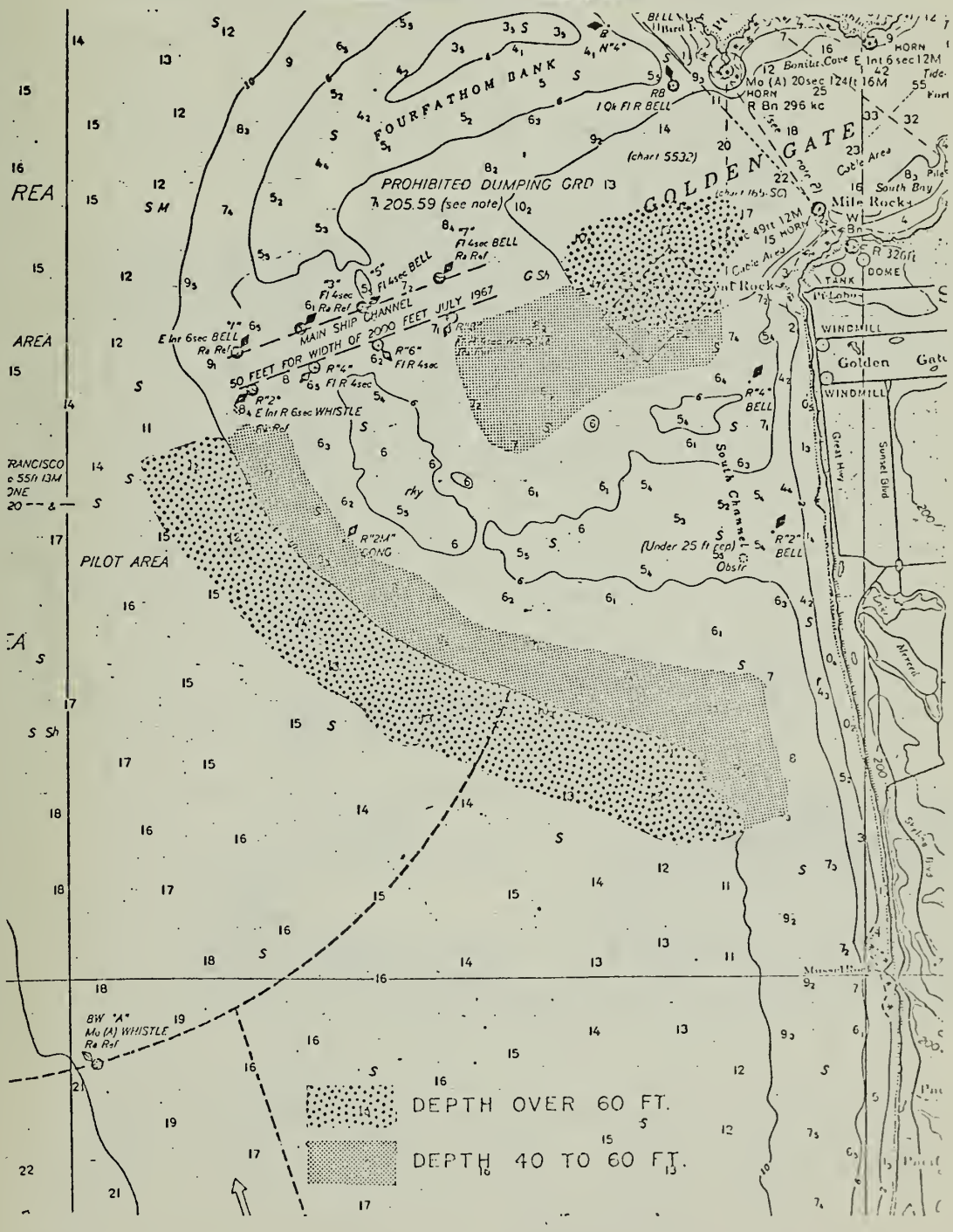
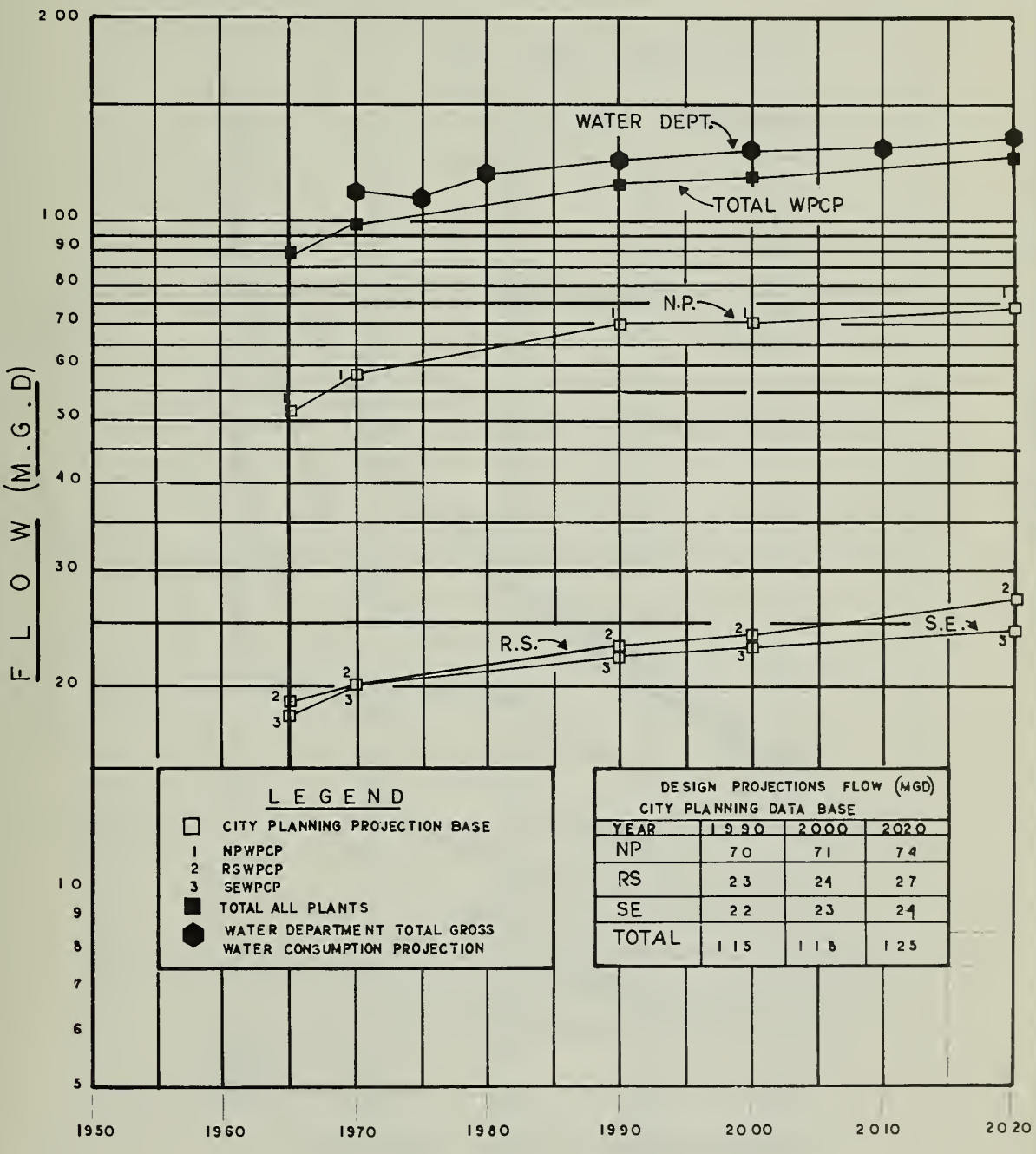

SUITABLE DISPOSAL AREAS
FOURFATHOM BANK
PROHIBITED DUMPING GRD
7 205.59 (see note)
MAIN SHIP CHANNEL 2000 FEET JULY 1967
50 FEET FOR WIDTH OF
GOLDEN GATE
PILOT AREA
South Channel
(Under 25 ft Depth)
Obstr
Mile Rocks
Fort Point
Golden Gate
WINDMILL
Great Hwy
Sunset Blvd
Merced
DEPTH OVER 60 FT.
DEPTH 40 TO 60 FT.

PLATE V-1

AVERAGE DRY WEATHER DAY FLOW PROJECTIONS



LEGEND

- □ CITY PLANNING PROJECTION BASE
- 1 NPWPCP
- 2 RSWPCP
- 3 SEWPCP
- ■ TOTAL ALL PLANTS
- ⬢ WATER DEPARTMENT TOTAL GROSS WATER CONSUMPTION PROJECTION

DESIGN PROJECTIONS FLOW (MGD)
CITY PLANNING DATA BASE

YEAR	1990	2000	2020
NP	70	71	74
RS	23	24	27
SE	22	23	24
TOTAL	115	118	125

DRAWN BY JC 6-22-71
CHECKED BY MN
DSE-71-543

PLATE V-2

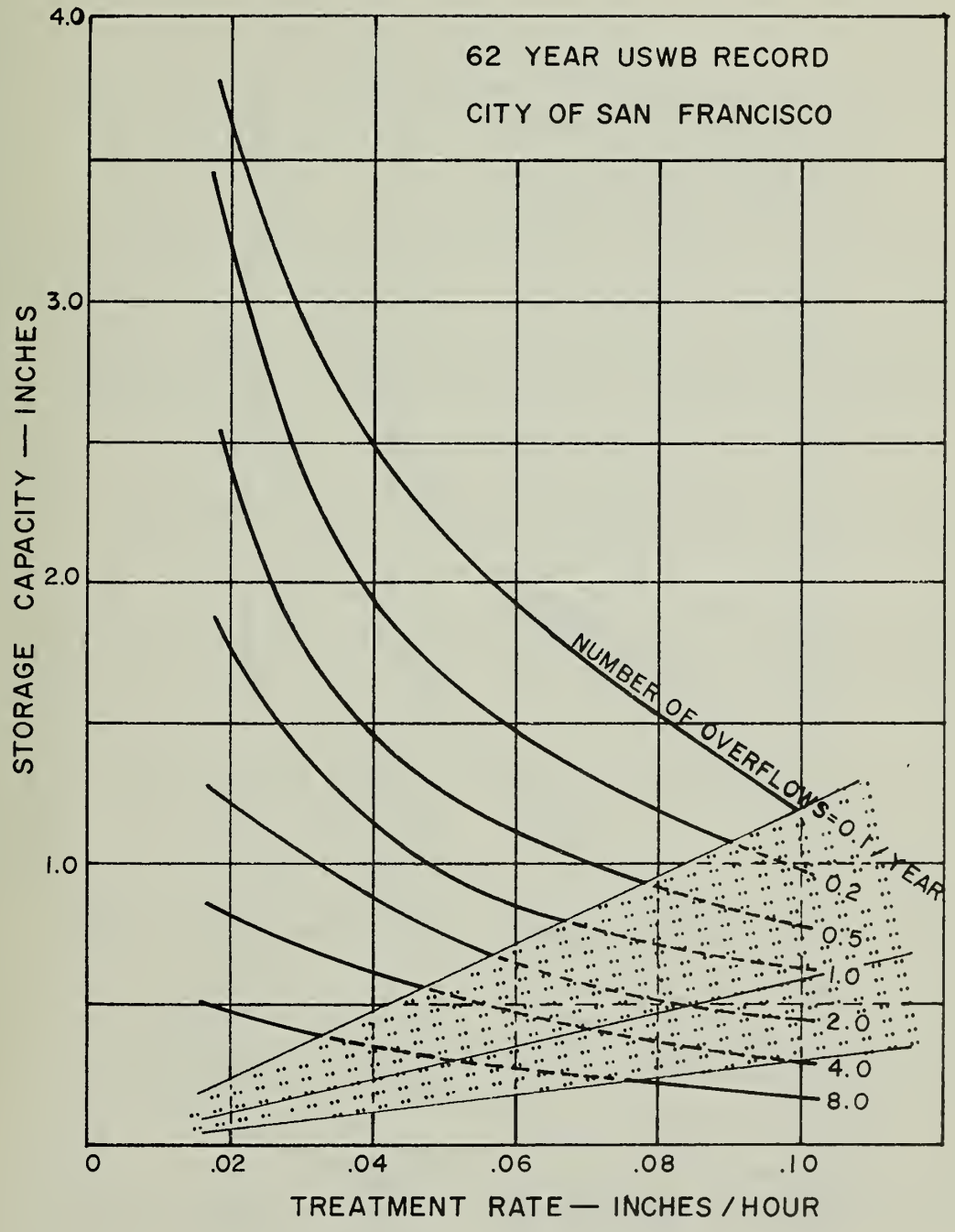

62 YEAR USWB RECORD
CITY OF SAN FRANCISCO
STORAGE CAPACITY — INCHES
4.0
3.0
2.0
1.0
0
.02
.04
.06
.08
.10
TREATMENT RATE — INCHES / HOUR
NUMBER OF OVERFLOWS=0.1/YEAR
0.2
0.5
1.0
2.0
4.0
8.0

PLATE V-3

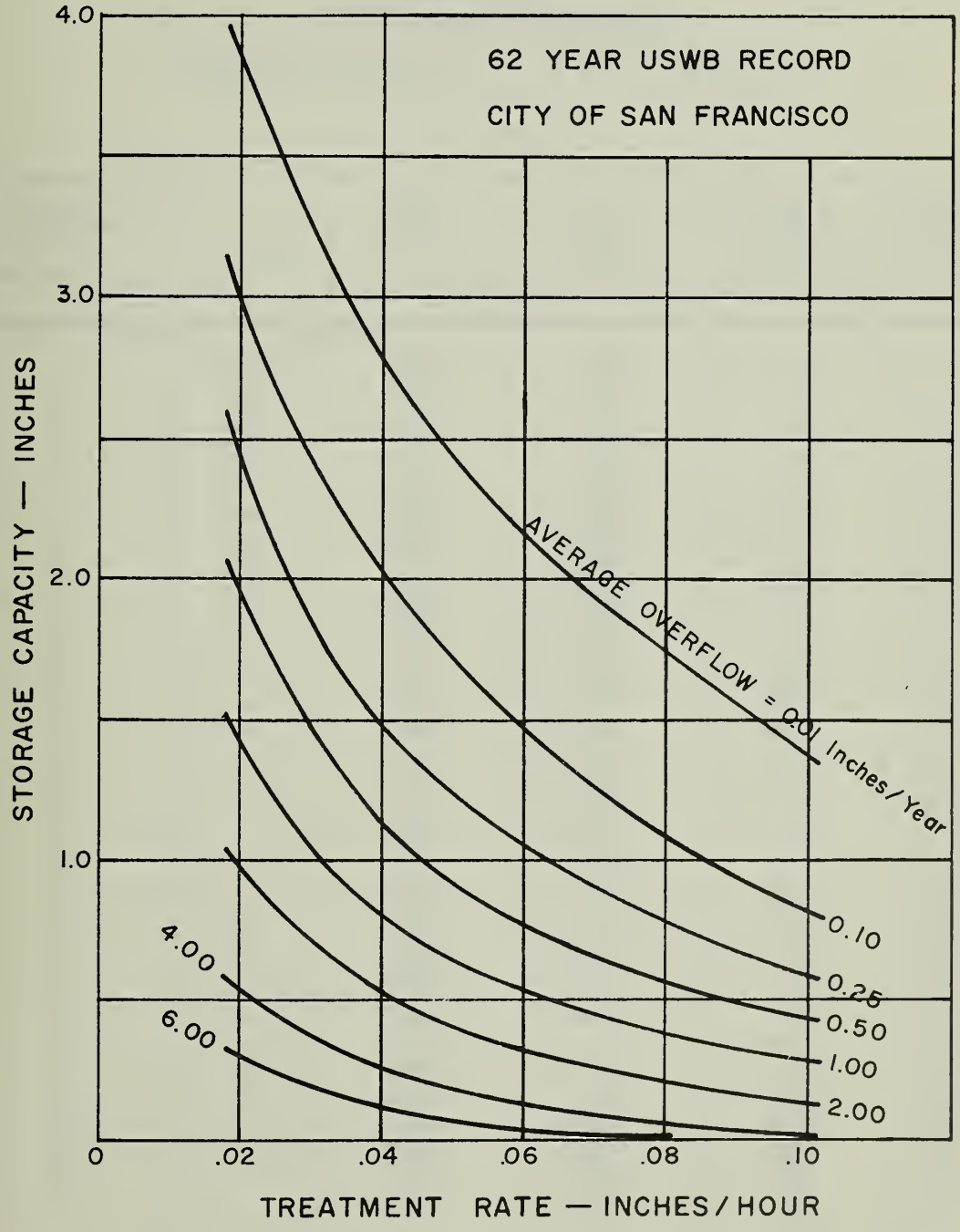

62 YEAR USWB RECORD
CITY OF SAN FRANCISCO
AVERAGE OVERFLOW = 0.01 Inches/Year
0.10
0.25
0.50
1.00
2.00
4.00
6.00
STORAGE CAPACITY — INCHES
TREATMENT RATE — INCHES/HOUR
4.0
3.0
2.0
1.0
0
.02
.04
.06
.08
.10

PLATE V-4A

S.F. FEDERAL BUILDING

62-YEAR RECORD (1907-1968)

FREQUENCY DISTRIBUTION OF OVERFLOW VOLUMES FOR
0.02 IN/HR TREATMENT RATE & 0 INCH STORAGE

(1 OF 6 SHEETS)

VOLUME OF OVERFLOW (HUNDREDTHS OF AN INCH)	FREQUENCY	TOTAL VOLUME (HUNDREDTHS OF AN INCH)	CUMULATIVE TOTAL VOLUME (HUNDREDTHS OF AN INCH)	AVERAGE TOTAL VOLUME (HUNDREDTHS OF AN INCH)	AVERAGE ANNUAL VOLUME OF OVERFLOW (PERCENT)
1	806	806	806	13	.94
2	526	1052	1858	30	2.18
3	385	1155	3013	49	3.56
4	333	1332	4345	70	5.09
5	238	1190	5535	89	6.47
6	191	1146	6681	108	7.85
7	189	1323	8004	129	9.38
8	164	1312	9316	150	10.90
9	126	1134	10450	169	12.28
10	124	1240	11690	189	13.74
11	126	1386	13076	211	15.33
12	97	1164	14240	230	16.72
13	85	1105	15345	248	18.02
14	93	1302	16647	269	19.55
15	80	1200	17847	288	20.93
16	67	1072	18919	305	22.17
17	48	816	19735	318	23.11
18	62	1116	20851	336	24.42
19	64	1216	22067	356	25.87
20	67	1340	23407	378	27.47
21	56	1176	24583	397	28.85
22	42	924	25507	411	29.87
23	45	1035	26542	428	31.10
24	43	1032	27574	445	32.34
25	32	800	28374	458	33.28
26	40	1040	29414	474	34.45
27	27	729	30143	486	35.32
28	36	1008	31151	502	36.48
29	37	1073	32224	520	37.79
30	31	930	33154	535	38.88
31	34	1054	34208	552	40.12
32	31	992	35200	568	41.28
33	23	759	35959	580	42.15

S.F. FEDERAL BUILDING

62-YEAR RECORD (1907-1968)

FREQUENCY DISTRIBUTION OF OVERFLOW VOLUMES FOR
0.02 IN/HR TREATMENT RATE & 0 INCH STORAGE

(2 OF 6 SHEETS)

VOLUME OF OVERFLOW (HUNDREDTHS OF AN INCH)	FREQUENCY	TOTAL VOLUME (HUNDREDTHS OF AN INCH)	CUMULATIVE TOTAL VOLUME (HUNDREDTHS OF AN INCH)	AVERAGE TOTAL VOLUME (HUNDREDTHS OF AN INCH)	AVERAGE ANNUAL VOLUME OF OVERFLOW (PERCENT)
34	22	748	36707	592	43.02
35	15	525	37237	601	43.68
36	21	756	37988	613	44.55
37	28	1036	39024	629	45.71
38	21	798	39822	642	46.66
39	16	624	40446	652	47.38
40	8	320	40766	658	47.82
41	19	779	41545	670	48.69
42	24	1008	42553	686	49.85
43	12	516	43069	695	50.51
44	13	572	43641	704	51.16
45	14	630	44271	714	51.89
46	18	828	45099	727	52.83
47	15	705	45804	739	53.71
48	15	720	46524	750	54.51
49	12	588	47112	760	55.23
50	19	950	48062	775	56.32
51	16	816	48878	788	57.27
52	17	884	49762	803	58.36
53	15	795	50557	815	59.23
54	13	702	51259	827	60.10
55	11	605	51864	837	60.83
56	12	672	52536	847	61.56
57	8	456	52992	855	62.14
58	4	232	53224	858	62.35
59	9	531	53755	867	63.01
60	13	780	54535	880	63.95
61	10	610	55145	889	64.61
62	4	248	55393	893	64.90
63	6	378	55771	900	65.41
64	12	768	56539	912	66.28
65	13	845	57384	926	67.30
66	3	198	57582	929	67.51
67	7	469	58051	936	68.02
68	9	612	58663	946	68.75

PLATE V-4c

S.F. FEDERAL BUILDING

62-YEAR RECORD (1907-1968)

FREQUENCY DISTRIBUTION OF OVERFLOW VOLUMES FOR
0.02 IN/HR TREATMENT RATE & 0 INCH STORAGE

(3 OF 6 SHEETS)

VOLUME OF OVERFLOW (HUNDREDTHS OF AN INCH)	FREQUENCY	TOTAL VOLUME (HUNDREDTHS OF AN INCH)	CUMULATIVE TOTAL VOLUME (HUNDREDTHS OF AN INCH)	AVERAGE TOTAL VOLUME (HUNDREDTHS OF AN INCH)	AVERAGE ANNUAL VOLUME OF OVERFLOW (PERCENT)
69	8	552	59215	955	69.40
70	7	490	59705	963	69.99
71	4	284	59989	968	70.35
72	7	504	60493	976	70.93
73	6	438	60931	983	71.44
74	7	518	61449	991	72.02
75	3	225	61674	995	72.31
76	13	988	62662	1011	73.47
77	3	231	62893	1014	73.69
78	3	234	63127	1018	73.98
79	3	237	63364	1022	74.27
80	8	640	64104	1032	75.00
81	1	81	64085	1034	75.15
82	4	328	64413	1039	75.51
83	4	332	64745	1044	75.87
84	3	252	64997	1048	76.16
85	9	765	65762	1061	77.11
86	5	430	66192	1968	77.62
87	1	87	66279	1069	77.69
88	3	264	66543	1073	77.98
89	3	267	66810	1078	78.34
90	5	450	67260	1085	78.85
91	3	273	67533	1089	79.14
92	2	184	67717	1092	79.36
93	2	186	67903	1095	79.58
94	7	658	68561	1106	80.38
96	2	192	68753	1109	80.60
97	2	194	68947	1112	80.81
98	3	294	69241	1117	81.18
99	4	396	69637	1123	81.61
100	3	300	69937	1128	81.98
101	5	505	70442	1136	82.56
102	4	408	70850	1143	83.07
103	3	309	71159	1148	83.43
104	2	208	71367	1151	83.65

S.F. FEDERAL BUILDING

62-YEAR RECORD (1907-1968)

FREQUENCY DISTRIBUTION OF OVERFLOW VOLUMES FOR
0.02 IN/HR TREATMENT RATE & 0 INCH STORAGE

(4 OF 6 SHEETS)

VOLUME OF OVERFLOW (HUNDREDTHS OF AN INCH)	FREQUENCY	TOTAL VOLUME (HUNDREDTHS OF AN INCH)	CUMULATIVE TOTAL VOLUME (HUNDREDTHS OF AN INCH)	AVERAGE TOTAL VOLUME (HUNDREDTHS OF AN INCH)	AVERAGE ANNUAL VOLUME OF OVERFLOW (PERCENT)
105	3	315	71682	1156	84.01
106	4	424	72106	1163	84.52
107	4	428	72534	1170	85.03
108	4	432	72966	1177	85.54
109	5	545	73511	1186	86.19
110	2	220	73731	1189	86.41
111	2	222	73953	1193	86.70
112	2	224	74177	1196	86.92
113	2	226	74403	1200	87.21
114	2	228	74631	1204	87.50
115	3	345	74976	1209	87.86
117	1	117	75093	1211	88.01
118	2	236	75329	1215	88.30
119	3	357	75686	1221	88.74
120	2	240	75926	1225	89.93
121	1	121	76047	1227	89.17
123	1	123	76170	1229	89.32
124	2	248	76418	1233	89.61
126	3	378	76796	1239	90.94
127	1	127	76923	1241	90.19
130	3	390	77313	1247	90.63
132	2	264	77577	1251	90.92
133	2	266	77843	1256	91.28
134	1	134	77977	1258	91.42
135					
136	1	136	78113	1260	91.57

PLATE V-4E

S.F. FEDERAL BUILDING

62-YEAR RECORD (1907-1968)

FREQUENCY DISTRIBUTION OF OVERFLOW VOLUMES FOR
0.02 IN/HR TREATMENT RATE & 0 INCH STORAGE

(5 OF 6 SHEETS)

VOLUME OF OVERFLOW (HUNDREDTHS OF AN INCH)	FREQUENCY	TOTAL VOLUME (HUNDREDTHS OF AN INCH)	CUMULATIVE TOTAL VOLUME (HUNDREDTHS OF AN INCH)	AVERAGE TOTAL VOLUME (HUNDREDTHS OF AN INCH)	AVERAGE ANNUAL VOLUME OF OVERFLOW (PERCENT)
138	2	276	78389	1264	91.86
139	2	278	78667	1269	92.22
141	1	141	78808	1271	92.37
142	2	284	79092	1276	92.73
144	2	288	79380	1280	93.0?
145	1	145	79525	1283	93.24
146	2	292	79817	1287	93.53
147	1	147	79964	1290	93.75
148	1	148	80112	1292	93.90
157	2	314	80426	1297	94.26
159	1	159	80585	1300	94.48
162	1	162	80747	1302	94.62
163	2	326	81073	1308	95.06
166	2	332	81405	1313	95.42
167	1	167	81572	1316	95.64
181	1	181	81753	1319	95.86
185	1	185	81938	1322	96.08
186	1	187	82125	1325	96.29
188	1	188	82313	1328	96.51
200	1	200	82513	1331	96.73

PLATE V-4F

S.F. FEDERAL BUILDING

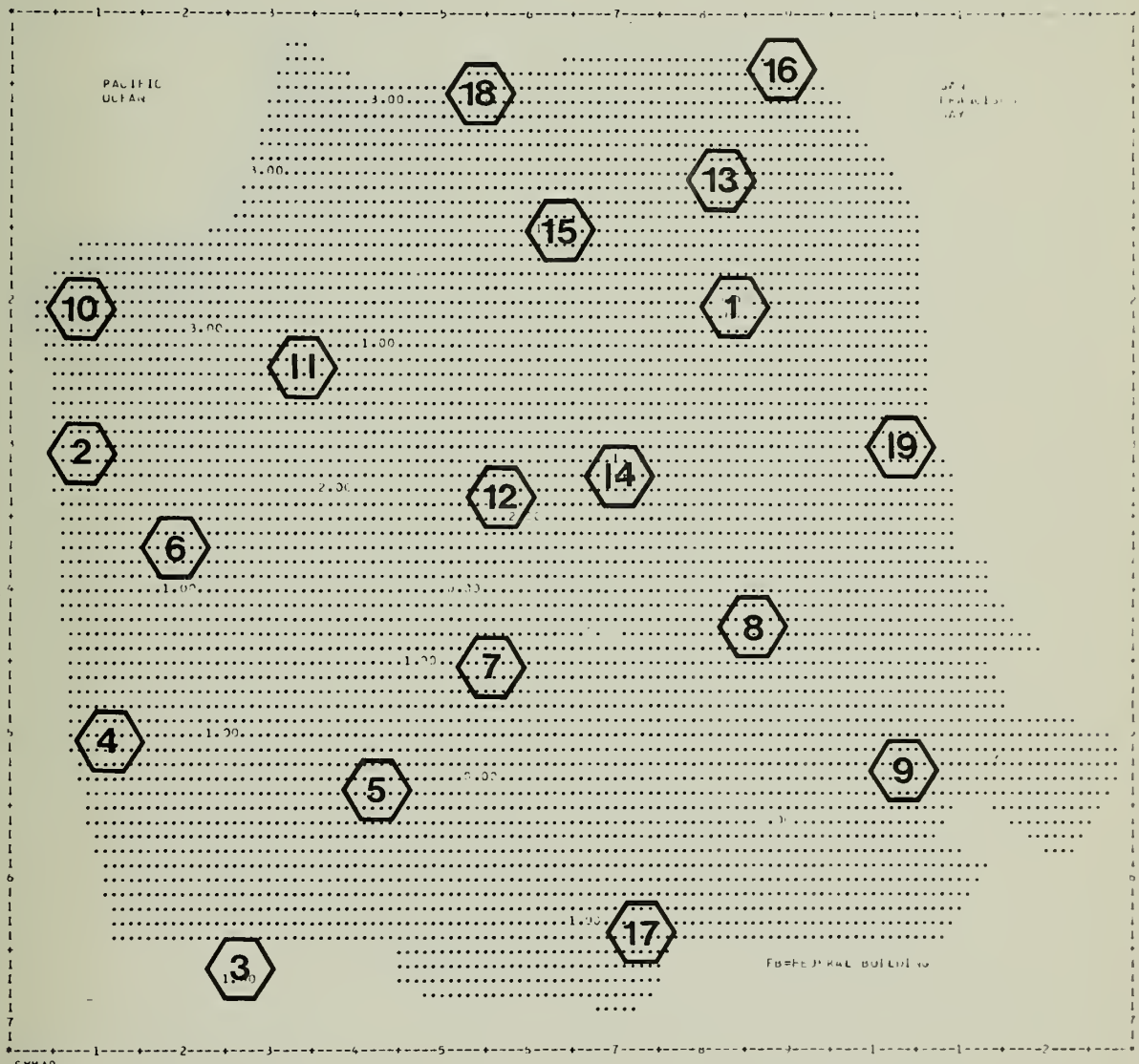
62-YEAR RECORD (1907-1968)

FREQUENCY DISTRIBUTION OF OVERFLOW VOLUMES FOR
0.02 IN/HR TREATMENT RATE & 0 INCH STORAGE

(6 OF 6 SHEETS)

VOLUME OF OVERFLOW (HUNDREDTHS OF AN INCH)	FREQUENCY	TOTAL VOLUME (HUNDREDTHS OF AN INCH)	CUMULATIVE TOTAL VOLUME (HUNDREDTHS OF AN INCH)	AVERAGE TOTAL VOLUME (HUNDREDTHS OF AN INCH)	AVERAGE ANNUAL VOLUME OF OVERFLOW (PERCENT)
291	1	201	82714	1334	96.95
206	1	206	82920	1337	97.17
211	1	211	83131	1341	97.46
216	1	216	83347	1344	97.67
229	1	229	83576	1348	97.97
263	1	263	83839	1352	98.26
264	1	264	84103	137	
266	1	265	84368	1361	98.91
287	1	287	84655	1365	99.20
301	1	301	84956	1370	99.56
325	1	325	85281	1376	100.0

PLATE V-5A



TIME = 0.0

RAIN GAUGE LOCATIONS FOR 1969-1970 RAINFALL SEASON

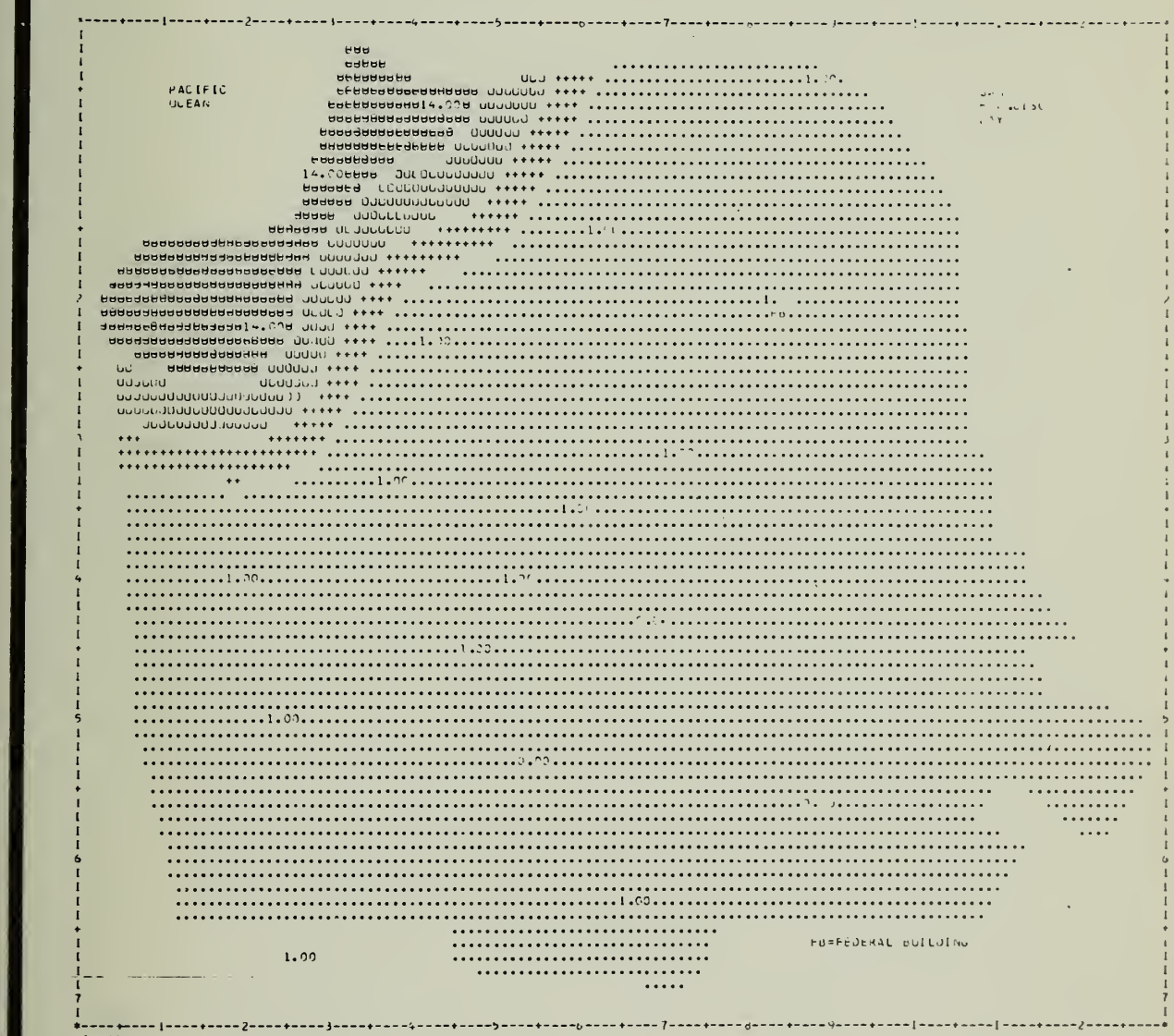
C RAINFALL ACCUMULATED FOR 3 MINUTES

C ENDING ON DAY 71, HOUR 11, MINUTE 52.

C SAN FRANCISCO DPW STORM ANALYSIS.

THIS MAP USES THE SF DPW 1971 GAUGE POSITIONS
GAUGES 13 AND 14 HAVE BEEN SET EQUAL TO GAUGE 11
GAUGE 23 HAS BEEN SET EQUAL TO GAUGE 21 WHEN 23 HAS MORE THAN
10 TIPS IN ONE TIME INTERVAL
*****
NUMBERS ON THE MAP REPRESENT TIPS (.01 INCH EACH) PER 3 MINUTE PERIOD

PLATE V-5B



SYMAP

TIME = 0.0

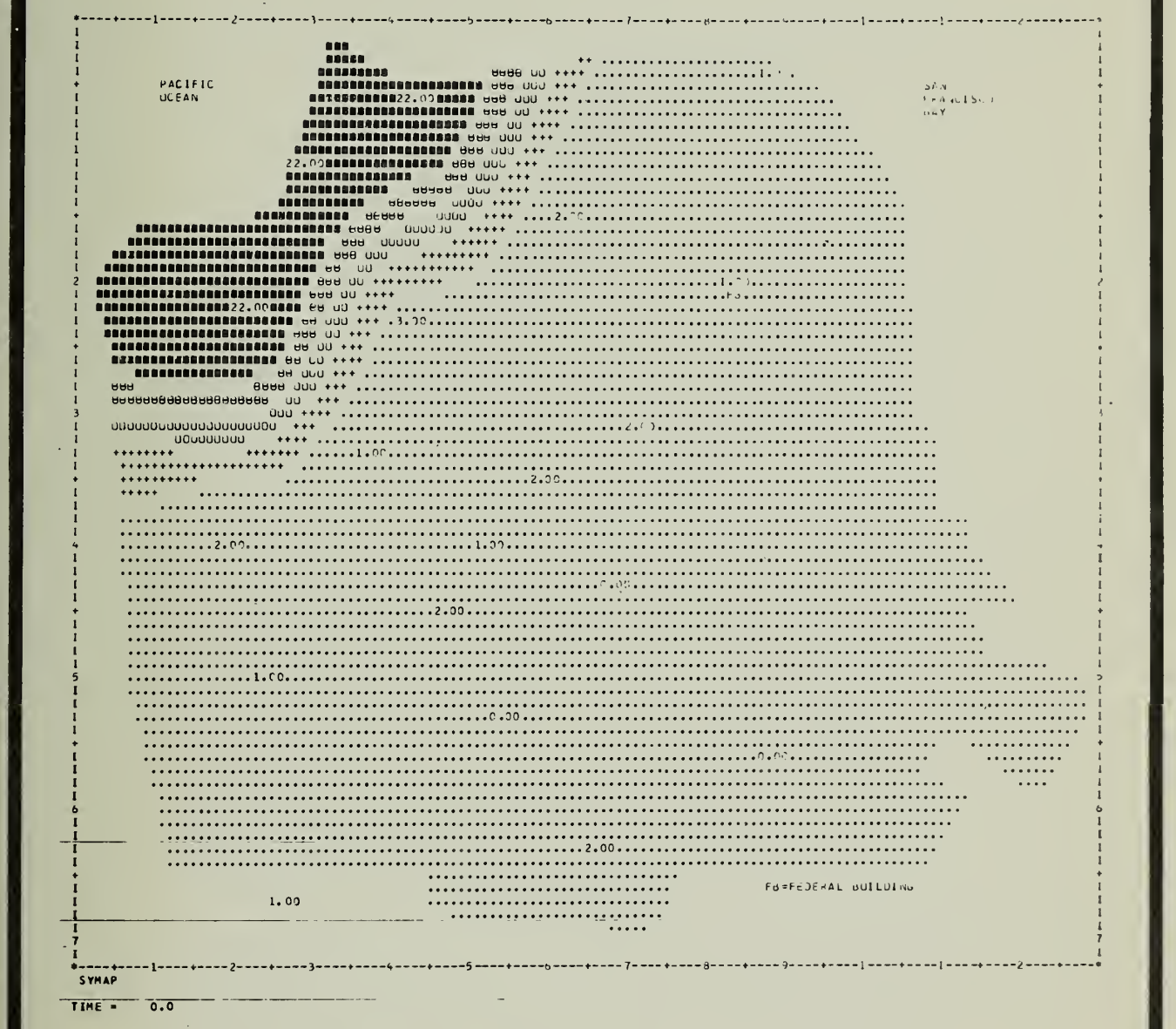
C RAINFALL ACCUMULATED FOR 3 MINUTES

C ENDING ON DAY 71, HOUR 11, MINUTE 55.

C SAN FRANCISCO DPW STORM ANALYSIS.

THIS MAP USES THE SF DPW 1971 GAUGE POSITIONS
GAUGES 13 AND 14 HAVE BEEN SET EQUAL TO GAUGE 11
GAUGE 23 HAS BEEN SET EQUAL TO GAUGE 21 WHEN 23 HAS MORE THAN
10 TIPS IN ONE TIME INTERVAL
*****
NUMBERS ON THE MAP REPRESENT TIPS (.01 INCH EACH) PER 3 MINUTE PERIOD

PLATE V-5c



SYMAP

TIME = 0.0

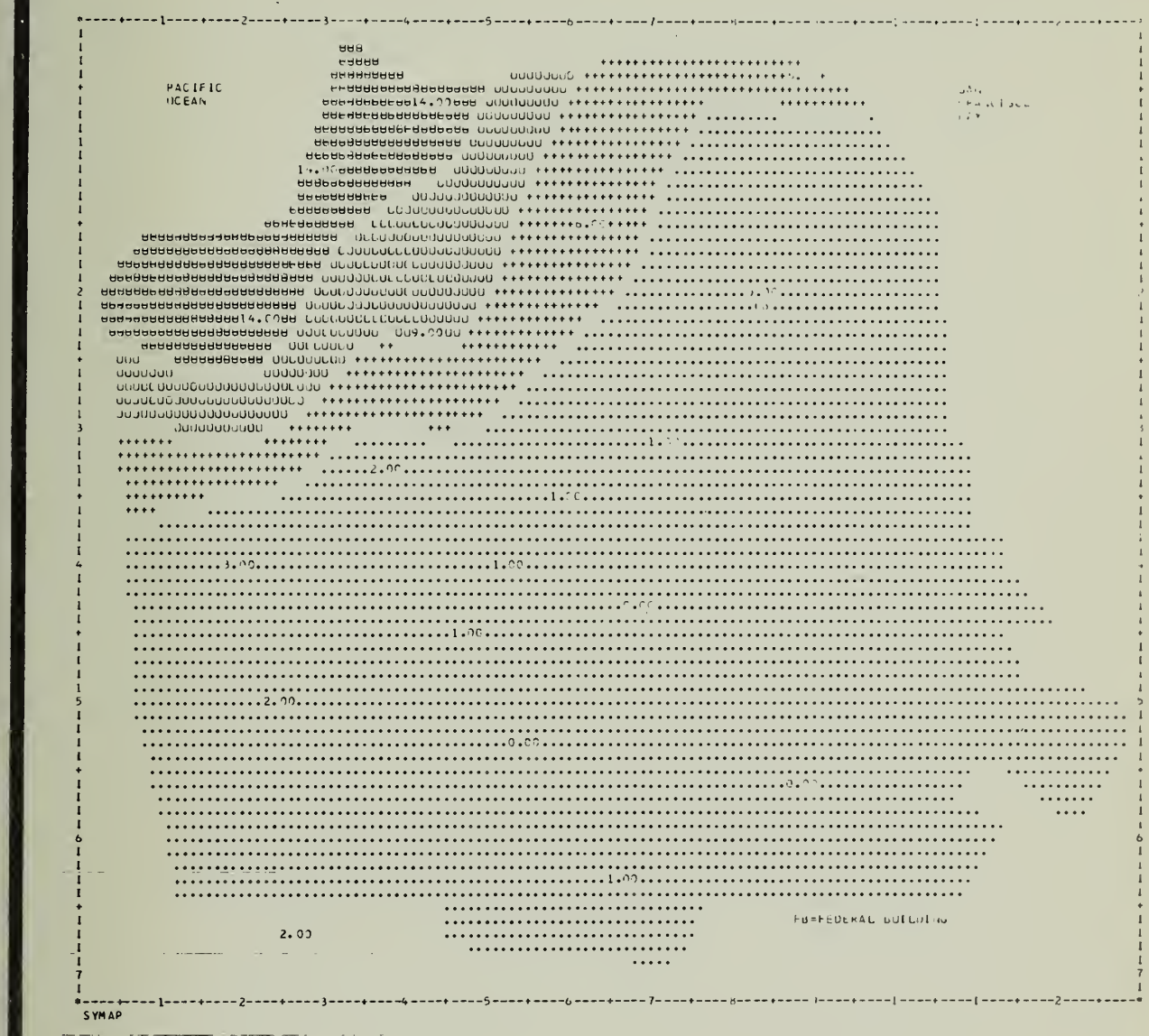
C RAINFALL ACCUMULATED FOR 3 MINUTES

C ENDING ON DAY 71, HOUR 11, MINUTE 58.

C SAN FRANCISCO DPW STORM ANALYSIS,

THIS MAP USES THE SF DPW 1971 GAUGE POSITIONS
GAUGES 13 AND 14 HAVE BEEN SET EQUAL TO GAUGE 11
GAUGE 23 HAS BEEN SET EQUAL TO GAUGE 21 WHEN 23 HAS MORE THAN
10 TIPS IN ONE TIME INTERVAL
*****
NUMBERS ON THE MAP REPRESENT TIPS (.01 INCH EACH) PER 3 MINUTE PERIOD

PLATE V-5D



SYMAP

TIME = 0.0

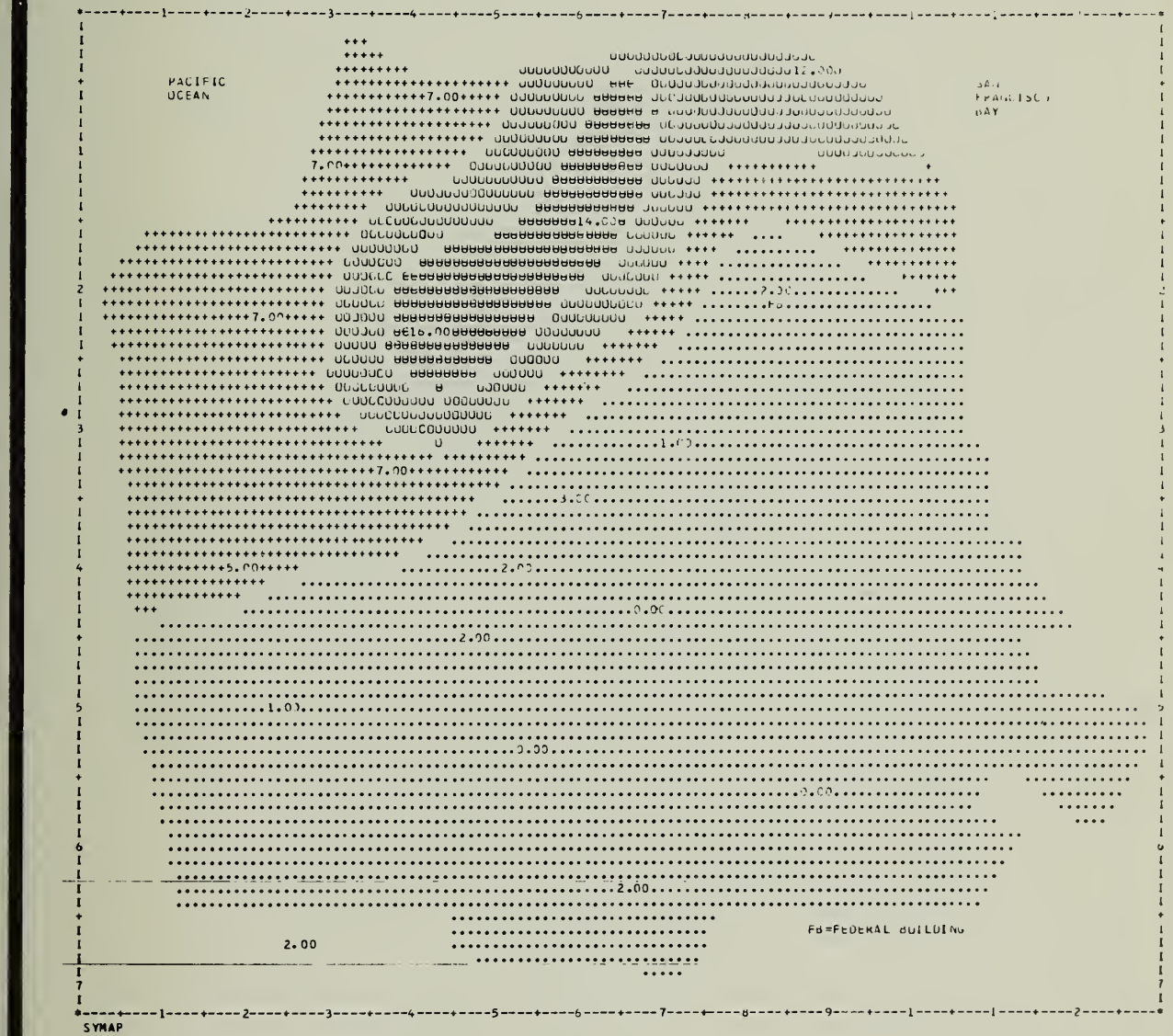
C RAINFALL ACCUMULATED FOR 3 MINUTES

C ENDING ON DAY 71, HOUR 12, MINUTE 1.

C SAN FRANCISCO DPW STORM ANALYSIS,

THIS MAP USES THE SF DPW 1971 GAUGE POSITIONS
GAUGES 13 AND 14 HAVE BEEN SET EQUAL TO GAUGE 11
GAUGE 23 HAS BEEN SET EQUAL TO GAUGE 21 WHEN 23 HAS MORE THAN
10 TIPS IN ONE TIME INTERVAL
*****
NUMBERS ON THE MAP REPRESENT TIPS (.01 INCH EACH) PER 3 MINUTE PERIOD

PLATE V-5E



TIME = 0.0

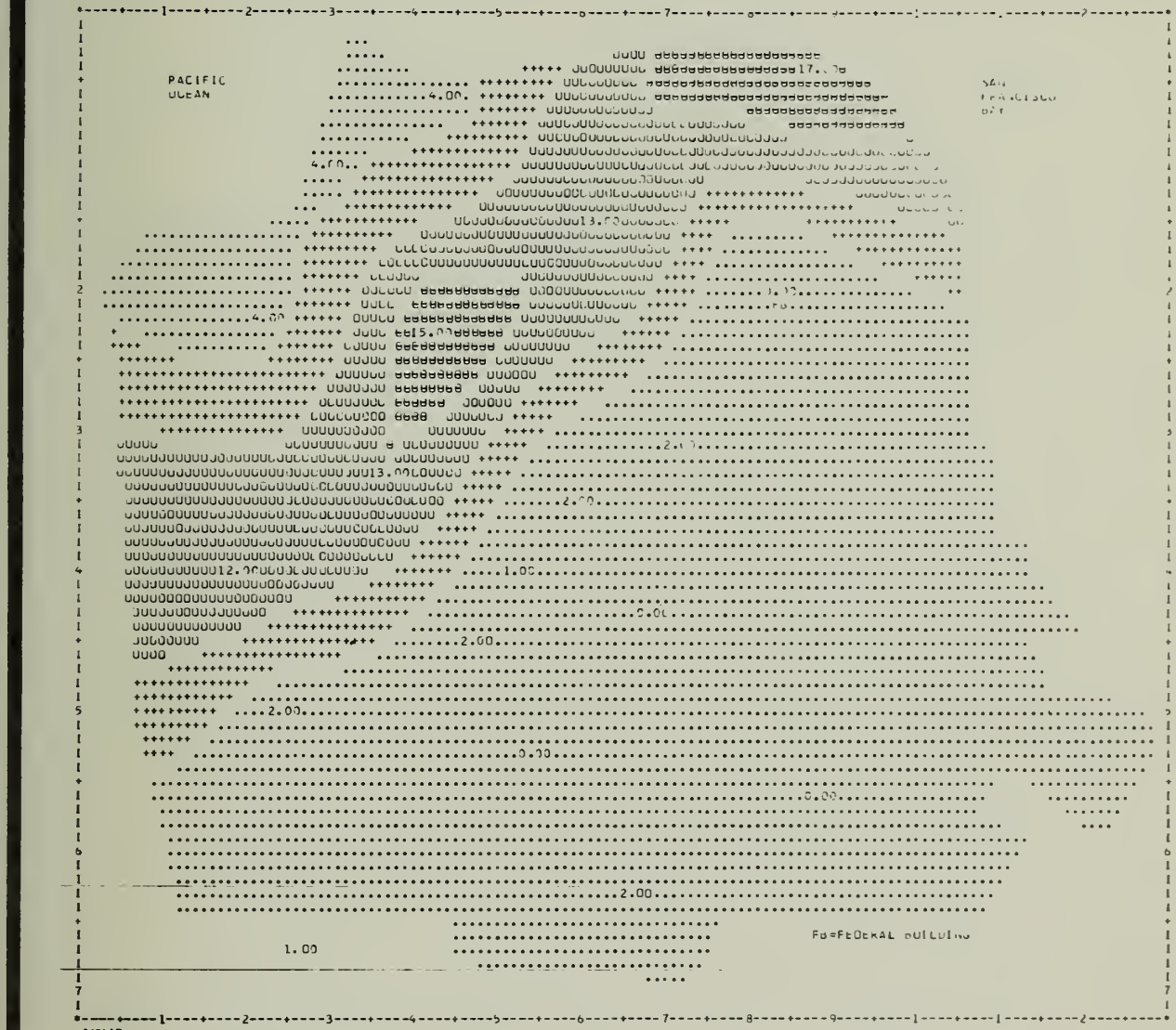
C RAINFALL ACCUMULATED FOR 3 MINUTES

C ENDING ON DAY 71, HOUR 12, MINUTE 4.

C SAN FRANCISCO DPW STORM ANALYSIS,

THIS MAP USES THE SF DPW 1971 GAUGE POSITIONS
GAUGES 13 AND 14 HAVE BEEN SET EQUAL TO GAUGE 11
GAUGE 23 HAS BEEN SET EQUAL TO GAUGE 21 WHEN 23 HAS MORE THAN
10 TIPS IN ONE TIME INTERVAL
*****
NUMBERS ON THE MAP REPRESENT TIPS (.01 INCH EACH) PER 3 MINUTE PERIOD

PLATE V-5F



TIME = 0.0

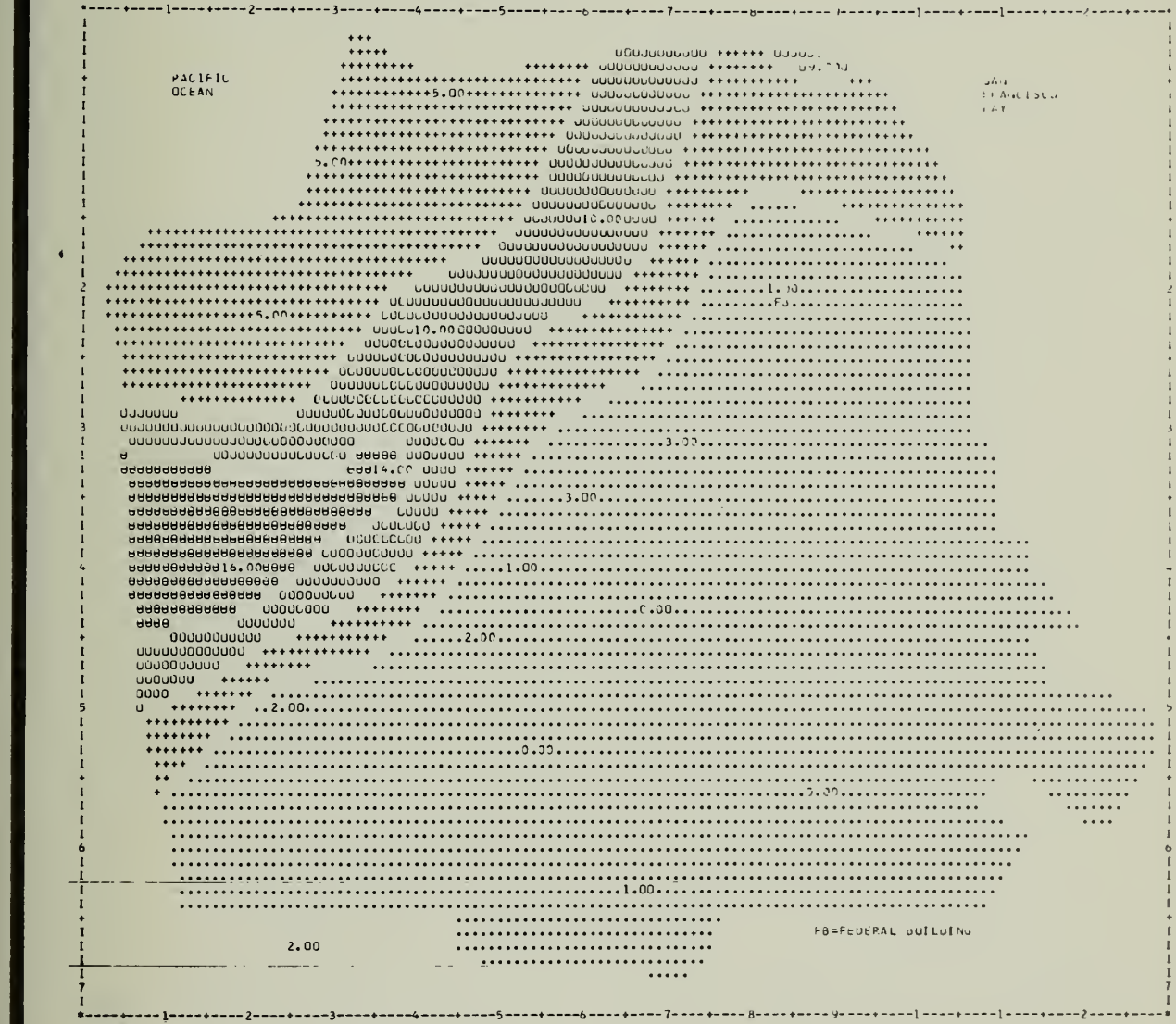
C RAINFALL ACCUMULATED FOR 3 MINUTES

C ENDING ON DAY 71, HOUR 12, MINUTE 7.

C SAN FRANCISCO DPW STORM ANALYSIS,

THIS MAP USES THE SF DPW 1971 GAUGE POSITIONS
GAUGES 13 AND 14 HAVE BEEN SET EQUAL TO GAUGE 11
GAUGE 23 HAS BEEN SET EQUAL TO GAUGE 21 WHEN 23 HAS MORE THAN
10 TIPS IN ONE TIME INTERVAL
*****
NUMBERS ON THE MAP REPRESENT TIPS (.01 INCH EACH) PER 3 MINUTE PERIOD

PLATE V-5G



SYMAP

TIME = 0.0

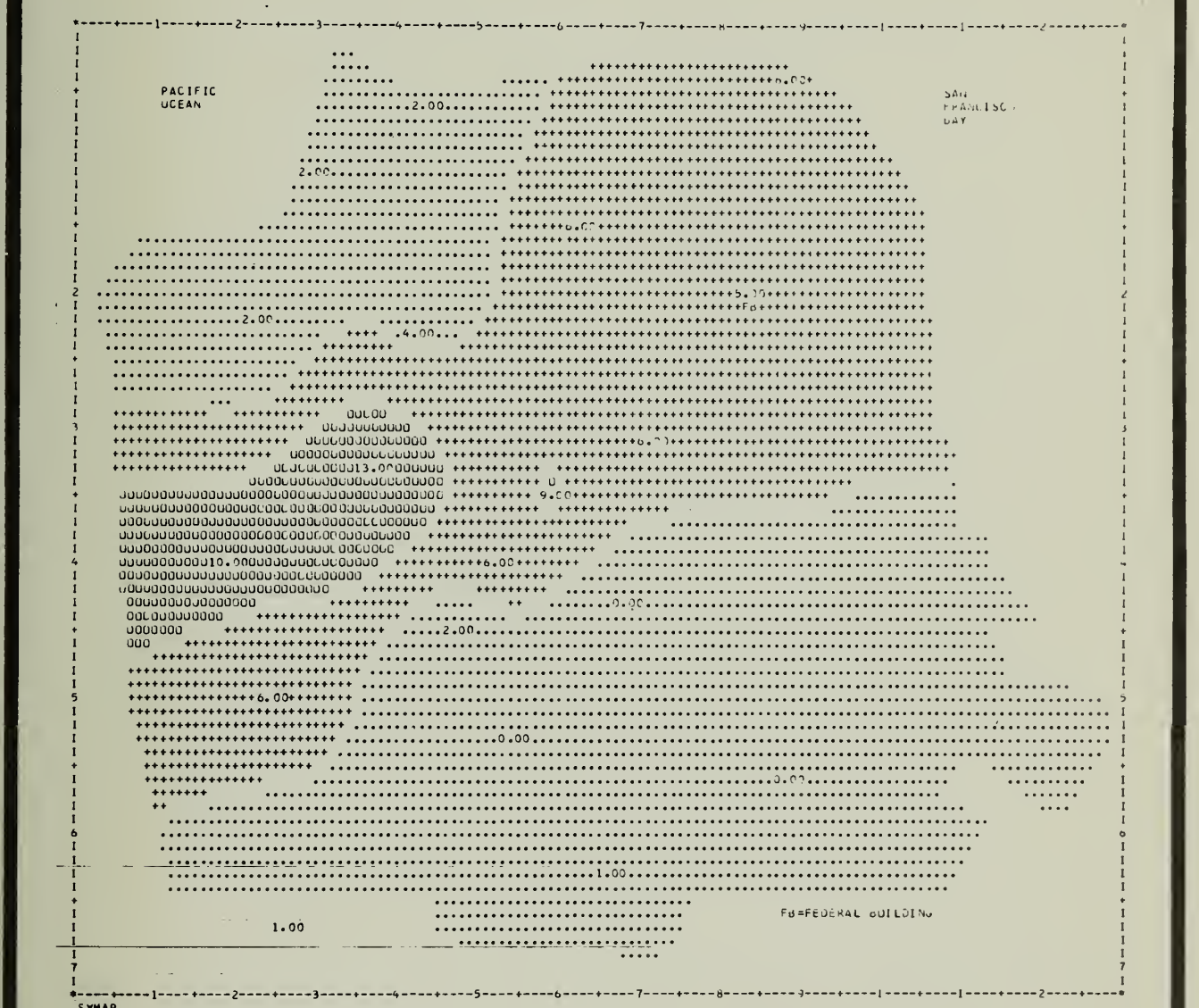
C RAINFALL ACCUMULATED FOR 3 MINUTES

C ENDING ON DAY 71, HOUR 12, MINUTE 10.

C SAN FRANCISCO DPW STORM ANALYSIS.

THIS MAP USES THE SF DPW 1971 GAUGE POSITIONS
GAUGES 13 AND 14 HAVE BEEN SET EQUAL TO GAUGE 11
GAUGE 23 HAS BEEN SET EQUAL TO GAUGE 21 WHEN 23 HAS MORE THAN
10 TIPS IN ONE TIME INTERVAL
*****
NUMBERS ON THE MAP REPRESENT TIPS (.01 INCH EACH) PER 3 MINUTE PERIOD

PLATE V-5H



TIME = 0.0

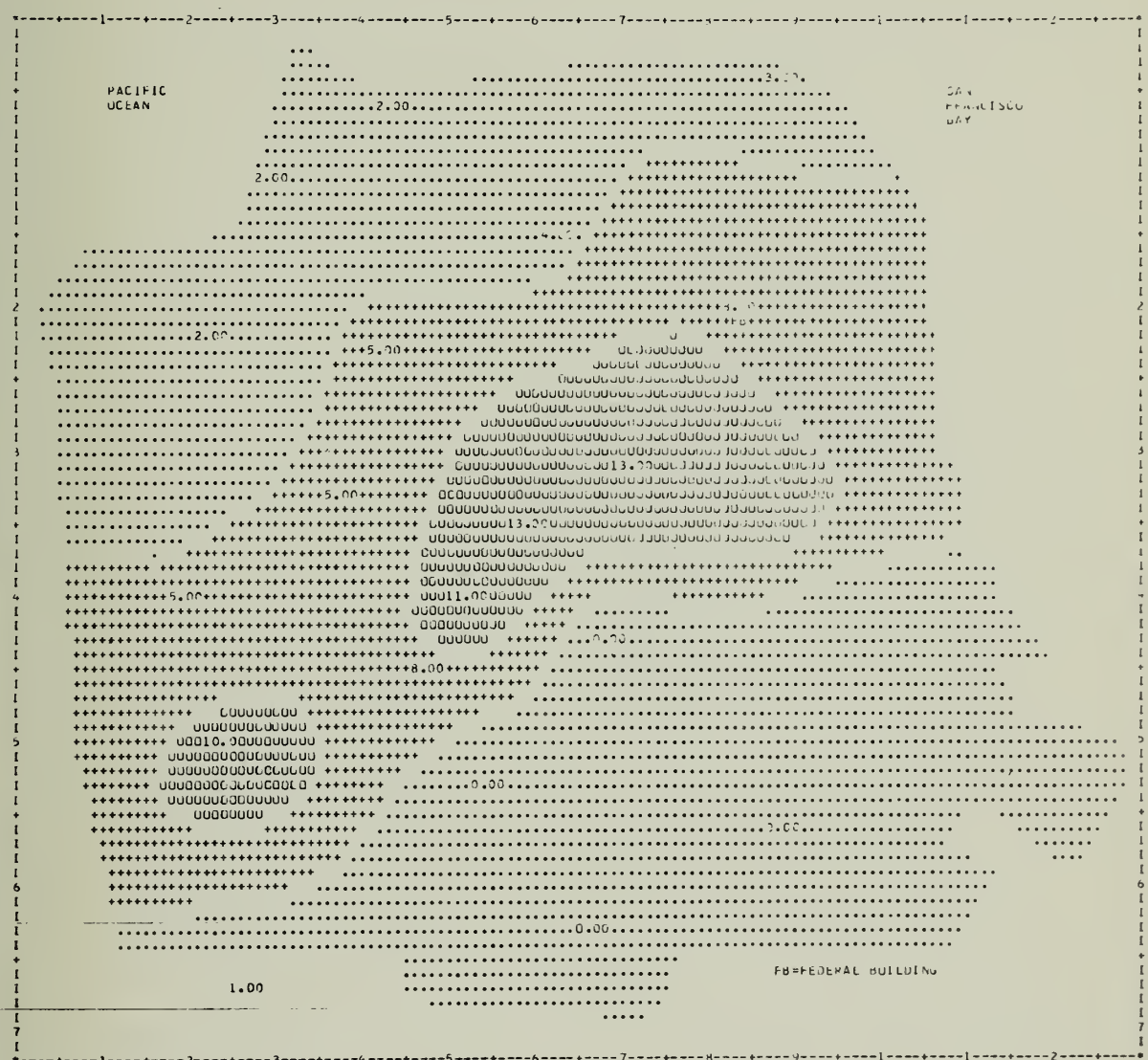
C RAINFALL ACCUMULATED FOR 3 MINUTES

C ENDING ON DAY 71, HOUR 12, MINUTE 13.

C SAN FRANCISCO DPW STORM ANALYSIS.

THIS MAP USES THE SF DPW 1971 GAUGE POSITIONS
GAUGES 13 AND 14 HAVE BEEN SET EQUAL TO GAUGE 11
GAUGE 23 HAS BEEN SET EQUAL TO GAUGE 21 WHEN 23 HAS MORE THAN
10 TIPS IN ONE TIME INTERVAL
*****
NUMBERS ON THE MAP REPRESENT TIPS (.01 INCH EACH) PER 3 MINUTE PERIOD

PLATE V-51



TIME = 0.0

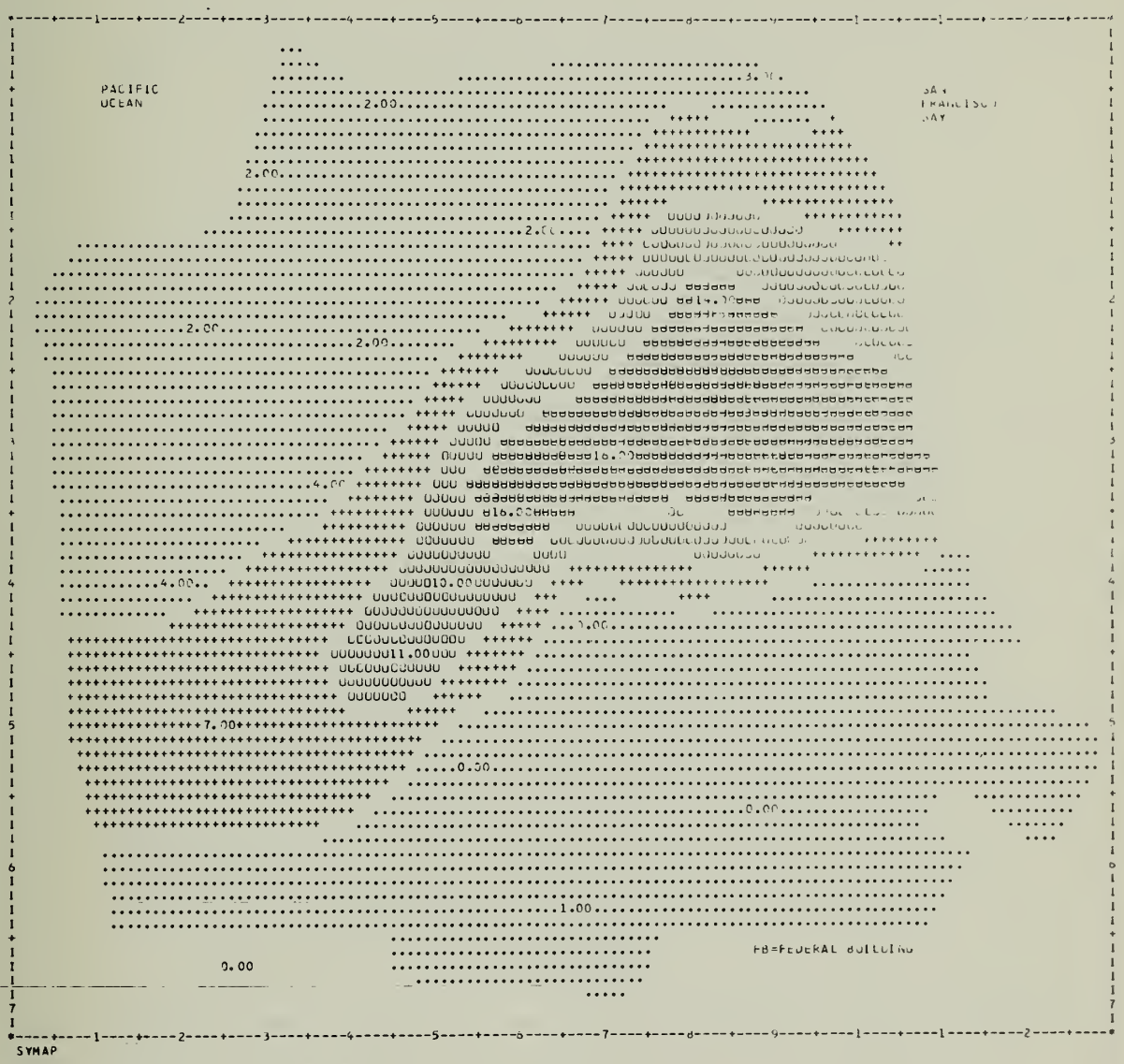
C RAINFALL ACCUMULATED FOR 3 MINUTES

C ENDING ON DAY 71, HOUR 12, MINUTE 16.

C SAN FRANCISCO DPW STORM ANALYSIS.

THIS MAP USES THE SF DPW 1971 GAUGE POSITIONS
GAUGES 13 AND 14 HAVE BEEN SET EQUAL TO GAUGE 11
GAUGE 23 HAS BEEN SET EQUAL TO GAUGE 21 WHEN 23 HAS MORE THAN
10 TIPS IN ONE TIME INTERVAL
*****
NUMBERS ON THE MAP REPRESENT TIPS 1.01 INCH EACH) PER 3 MINUTE PERIOD

PLATE V-5J



SYMAP

TIME = 0.0

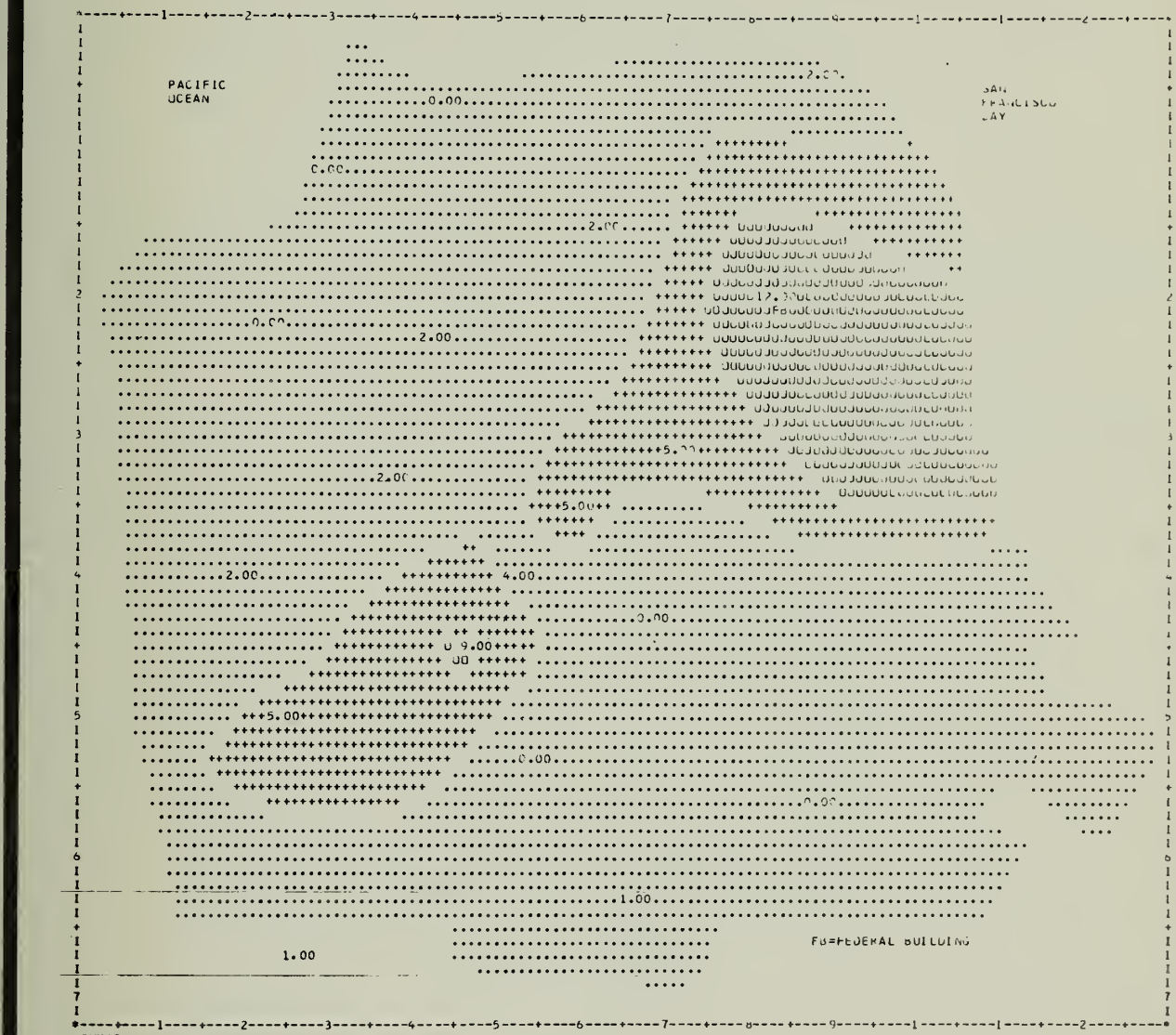
C RAINFALL ACCUMULATED FOR 3 MINUTES

C ENDING ON DAY 71, HOUR 12, MINUTE 19.

C SAN FRANCISCO OPW STORM ANALYSIS,

THIS MAP USES THE SF OPW 1971 GAUGE POSITIONS
GAUGES 13 AND 14 HAVE BEEN SET EQUAL TO GAUGE 11
GAUGE 23 HAS BEEN SET EQUAL TO GAUGE 21 WHEN 23 HAS MORE THAN
10 TIPS IN ONE TIME INTERVAL
*****
NUMBERS ON THE MAP REPRESENT TIPS (.01 INCH EACH) PER 3 MINUTE PERIOD

PLATE V-5K



TIME = 0.0

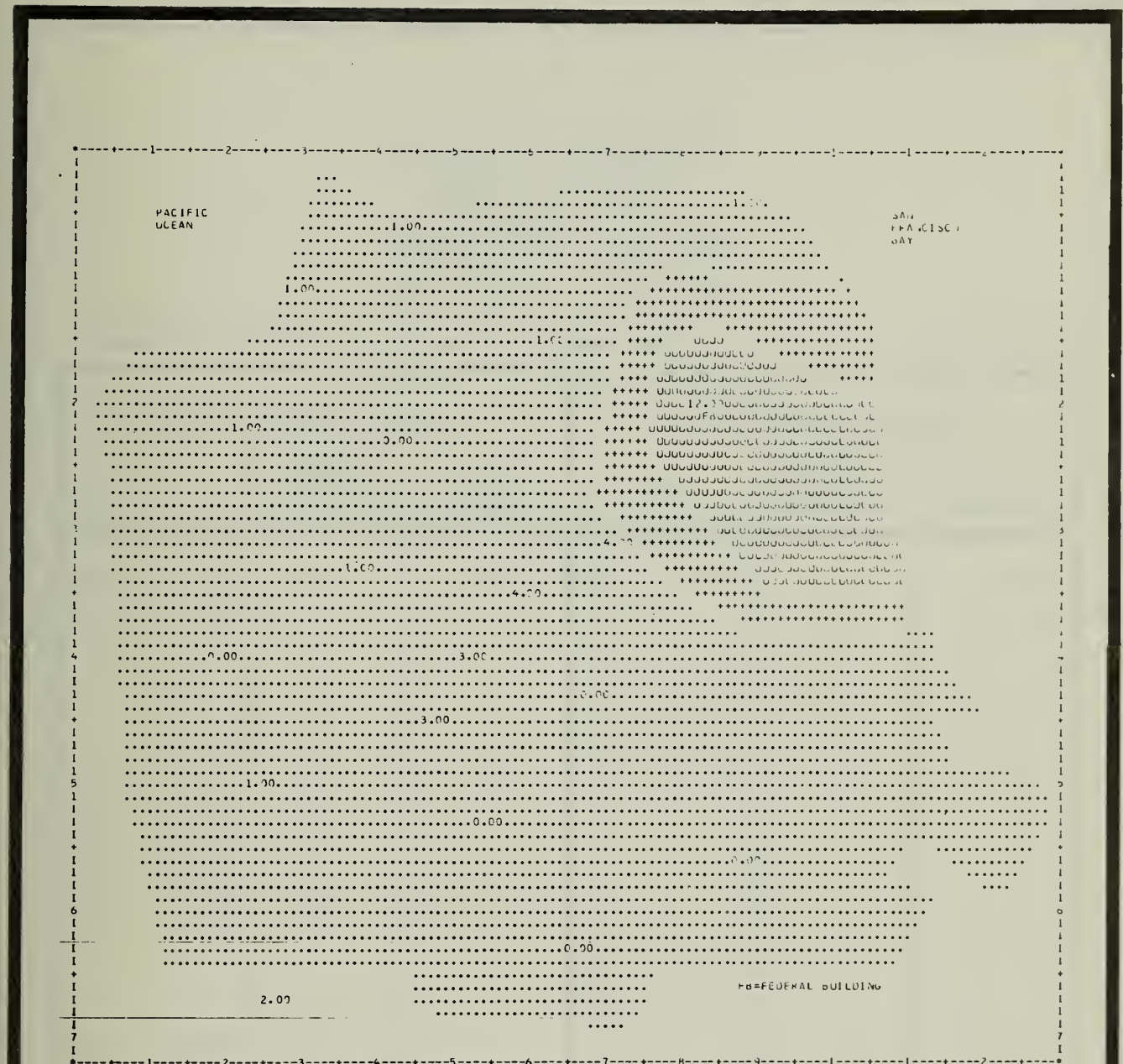
C RAINFALL ACCUMULATED FOR 3 MINUTES

C ENDING ON DAY 71, HOUR 12, MINUTE 22.

C SAN FRANCISCO DPW STORM ANALYSIS,

THIS MAP USES THE SF DPW 1971 GAUGE POSITIONS
GAUGES 13 AND 14 HAVE BEEN SET EQUAL TO GAUGE 11
GAUGE 23 HAS BEEN SET EQUAL TO GAUGE 21 WHEN 23 HAS MORE THAN
10 TIPS IN ONE TIME INTERVAL
*****
NUMBERS ON THE MAP REPRESENT TIPS (.01 INCH EACH) PER 3 MINUTE PERIOD

PLATE V-5L



SYMAP

TIME = 0.0

C RAINFALL ACCUMULATED FOR 3 MINUTES

C ENDING ON DAY 71, HOUR 12, MINUTE 25.

C SAN FRANCISCO DPW STORM ANALYSIS,

THIS MAP USES THE SF DPW 1971 GAUGE POSITIONS
GAUGES 13 AND 14 HAVE BEEN SET EQUAL TO GAUGE 11
GAUGE 23 HAS BEEN SET EQUAL TO GAUGE 21 WHEN 23 HAS MORE THAN
10 TIPS IN ONE TIME INTERVAL
*****
NUMBERS ON THE MAP REPRESENT TIPS (.01 INCH EACH) PER 3 MINUTE PERIOD

PLATE V-6A

OVERFLOW OCCURRENCES FOR PERIOD 1953-1968 AT TREATMENT RATE = 0.10 IN/HR STORAGE CAPACITY = 0.25 INCH

* NUMBER OF HOURS PAST MIDNIGHT THIS EVENT BEGAN.

FEDERAL BUILDING STATION			RICHMOND-SUNSET STATION		
DATE	QUANTITY OVERFLOWED (INCHES)	DURATION (HOURS)	DATE	QUANTITY OVERFLOWED (INCHES)	DURATION (HOURS)
Apr. 27, 1953	.73	6 *(1)	Apr. 27, 1953	.35	3 *(2)
Apr. 30, 1953	.08	2			
			Jan. 10, 1954	.05	2
			Jan. 16, 1954	.25	2
			Mar. 15, 1954	.09	3
Mar. 19, 1954	.09	2 *(2)	Mar. 19, 1954	.02	2 *(2)
Dec. 1, 1954	.15	3			
Dec. 5, 1954	.08	1			
Dec. 9, 1954	.01	1			
			Jan. 17, 1955	.05	1
			Apr. 25, 1955	.03	2
Dec. 1, 1955	.11	1			
Dec. 5, 1955	.32	4			
Dec. 21, 1955	.31	2 *(20)	Dec. 21, 1955	.44	3 *(19)
Dec. 22, 1955	.48	5 *(18)	Dec. 22, 1955	.49	5 *(18)
Dec. 26, 1955	.04	2 *(1)	Dec. 26, 1955	.09	2 *(1)
Jan. 7, 1956	.05	1 *(16)	Jan. 7, 1956	.35	2 *(15)
Jan. 14, 1956	1.63	6 *(10)	Jan. 14, 1956	.85	8 *(10)
Jan. 15, 1956	.10	4 *(9)	Jan. 15, 1956	.25	6 *(9)

PLATE V-6B

OVERFLOW OCCURRENCES FOR PERIOD 1953-1968 AT

TREATMENT RATE = 0.10 IN/HR

STORAGE CAPACITY = 0.25 INCH

* NUMBER OF HOURS PAST MIDNIGHT THIS EVENT BEGAN.

FEDERAL BUILDING STATION			RICHMOND-SUNSET STATION		
DATE	QUANTITY OVERFLOWED (INCHES)	DURATION (HOURS)	DATE	QUANTITY OVERFLOWED (INCHES)	DURATION (HOURS)
			Feb. 19, 1956	.03	2
Jan. 12, 1957	.37	3 *(16)	Jan. 12, 1957	.23	2 *(16)
			Jan. 19, 1957	.05	2
Jan. 20, 1957	.13	2			
Feb. 26, 1957	.07	2 *(11)	Feb. 26, 1957	.08	1 *(10)
			Apr. 17, 1957	.03	1
Sept. 27,1957	.07	2			
Oct. 10, 1957	.23	1			
Oct. 13, 1957	.17	4			
Dec. 15, 1957	.03	3 *(4)	Dec. 15, 1957	.16	3 *(4)
Dec. 16, 1957	.17	1			
			Jan. 1, 1958	.04	2
			Feb. 6, 1958	.06	1
Feb. 12, 1958	.07	1 *(3)	Feb. 12, 1958	.30	3 *(2)
Feb. 18, 1958	.05	1 *(14)	Feb. 18, 1958	.53	3 *(14)
			Feb. 24, 1958	.19	3
Mar. 22, 1958	.60	7			
			Mar. 23, 1958	.20	2
Mar. 29, 1958	.01	1 *(19)	Mar. 29, 1958	.08	1 *(18)

PLATE V-6C

OVERFLOW OCCURRENCES FOR PERIOD 1953-1968 AT TREATMENT RATE = 0.10 IN/HR STORAGE CAPACITY = 0.25 INCH

* NUMBER OF HOURS PAST MIDNIGHT THIS EVENT BEGAN.

FEDERAL BUILDING STATION			RICHMOND-SUNSET STATION		
DATE	QUANTITY OVERFLOWED (INCHES)	DURATION (HOURS)	DATE	QUANTITY OVERFLOWED (INCHES)	DURATION (HOURS)
Mar. 31, 1958	.18	4 *(21)	Mar. 31, 1958	.13	2 *(21)
Apr. 2, 1958	.68	2 *(11)	Apr. 2, 1958	.47	1 *(9)
			Apr. 5, 1958	.07	2
May 22, 1958	.30	1 *(19)	May 22, 1958	.13	2 *(19)
			Dec. 26, 1958	.16	1
Jan. 5, 1959	.19	4 *(14)	Jan. 5, 1959	.41	2 *(13)
Jan. 8, 1959	.03	1			
Jan. 9, 1959	.01	1			
			Feb. 17, 1959	.18	1
			Feb. 17, 1959	.20	2
Sept.18, 1959	.71	6 *(3)	Sept.18, 1959	.63	7 *(4)
			Jan. 11, 1960	.12	2
Feb. 4, 1960	.19	2 *(24)	Feb. 4, 1960	.03	1 *(24)
Feb. 8, 1960	.04	1 *(5)	Feb. 8, 1960	.12	2 *(5)
Nov. 25, 1960	.02	1 *(20)	Nov. 25, 1960	.04	1 *(21)
Dec. 1, 1960	.20	2 *(4)	Dec. 1, 1960	.76	3 *(5)
Jan. 25, 1961	.02	1			
Nov. 19, 1961	.50	4 *(20)	Nov. 19, 1961	.52	5 *(20)
			Nov. 29, 1961	.13	1

OVERFLOW OCCURRENCES FOR PERIOD 1953-1968 AT TREATMENT RATE = 0.10 IN/HR STORAGE CAPACITY = 0.25 INCH

* NUMBER OF HOURS PAST MIDNIGHT THIS EVENT BEGAN.

FEDERAL BUILDING STATION			RICHMOND-SUNSET STATION		
DATE	QUANTITY OVERFLOWED (INCHES)	DURATION (HOURS)	DATE	QUANTITY OVERFLOWED (INCHES)	DURATION (HOURS)
			Nov. 29, 1961	.20	1
Feb. 8, 1962	.09	2 *(24)	Feb. 8, 1962	.32	3 *(24)
			Feb. 9, 1962	.03	1
			Feb. 13, 1962	.07	1
Feb. 14, 1962	.31	2 *(9)	Feb. 14, 1962	.42	2 *(9)
			Feb. 14, 1962	.06	2 *(17)
Mar. 5, 1962	.16	1 *(17)	Mar. 5, 1962	.10	2 *(16)
Oct. 11, 1962	.53	5 *(18)	Oct. 11, 1962	.63	8 *(18)
Oct. 12, 1962	.57	6 *(18)	Oct. 12, 1962	2.13	28 *(16)
			Jan. 29, 1963	.01	1
			Jan. 30, 1963	.14	5
			Mar. 15, 1963	.10	1
Mar. 16, 1963	.03	3			
			Mar. 22, 1963	.03	3
Mar. 27, 1963	.06	3			
			Oct. 10, 1963	.11	2
			Nov. 5, 1963	.16	1
Nov. 23, 1963	.14	1			
Jan. 20, 1964	.51	5 *(16)	Jan. 20, 1964	.75	4 *(16)

PLATE V-6E

OVERFLOW OCCURRENCES FOR PERIOD 1953-1968 AT TREATMENT RATE = 0.10 IN/HR STORAGE CAPACITY = 0.25 INCH

* NUMBER OF HOURS PAST MIDNIGHT THIS EVENT BEGAN.

FEDERAL BUILDING STATION			RICHMOND-SUNSET STATION		
DATE	QUANTITY OVERFLOWED (INCHES)	DURATION (HOURS)	DATE	QUANTITY OVERFLOWED (INCHES)	DURATION (HOURS)
Oct. 29, 1964	.01	2			
Oct. 29, 1964	.10	1			
			Nov. 9, 1964	.15	1
Nov. 10, 1964	.09	1			
Dec. 29, 1964	.01	1			
			Jan. 5, 1965	.20	2
			Mar. 4, 1965	.02	1
Mar. 13, 1965	.13	1			
			Aug. 11, 1965	.40	2
			Nov. 12, 1965	.25	4
Nov. 13, 1965	.10	1			
Dec. 28, 1965	.21	4 *(12)	Dec. 28, 1965	.15	4 *(11)
			Jan. 4, 1966	.06	2
			Feb. 1, 1966	.02	1
Nov. 6, 1966	.10	1			
			Nov. 15, 1966	.12	1
Jan. 20, 1967	.42	7 *(7)	Jan. 20, 1967	1.13	15 *(15)
			Jan. 23, 1967	.15	2
			Jan. 26, 1967	.09	3

PLATE V-6F

OVERFLOW OCCURRENCES FOR PERIOD 1953-1968 AT

TREATMENT RATE = 0.10 IN/HR

STORAGE CAPACITY = 0.25 INCH

* NUMBER OF HOURS PAST MIDNIGHT THIS EVENT BEGAN.

FEDERAL BUILDING STATION			RICHMOND-SUNSET STATION		
DATE	QUANTITY OVERFLOWED (INCHES)	DURATION (HOURS)	DATE	QUANTITY OVERFLOWED (INCHES)	DURATION (HOURS)
			Jan. 28, 1967	.02	1
Jan. 30, 1967	.05	1 *(4)	Jan. 30, 1967	.07	2 *(3)
Apr. 6, 1967	.14	2			
Dec. 17, 1967	.02	1 *(22)	Dec. 17, 1967	.07	1 *(21)
Jan. 10, 1968	.34	2 *(3)	Jan. 10, 1968	.45	3 *(2)
Jan. 29, 1968	.40	4 *(23)	Jan. 29, 1968	.36	2 *(20)
Mar. 12, 1968	.32	3 *(14)	Mar. 12, 1968	.70	6 *(14)
Dec. 28, 1968	.02	1			

PLATE V-7

COMPOSITE EFFECTS OF VARIOUS STORAGE CAPACITIES AND TREATMENT RATE COMBINATIONS IN RELATION TO OVERFLOW OCCURRENCIES

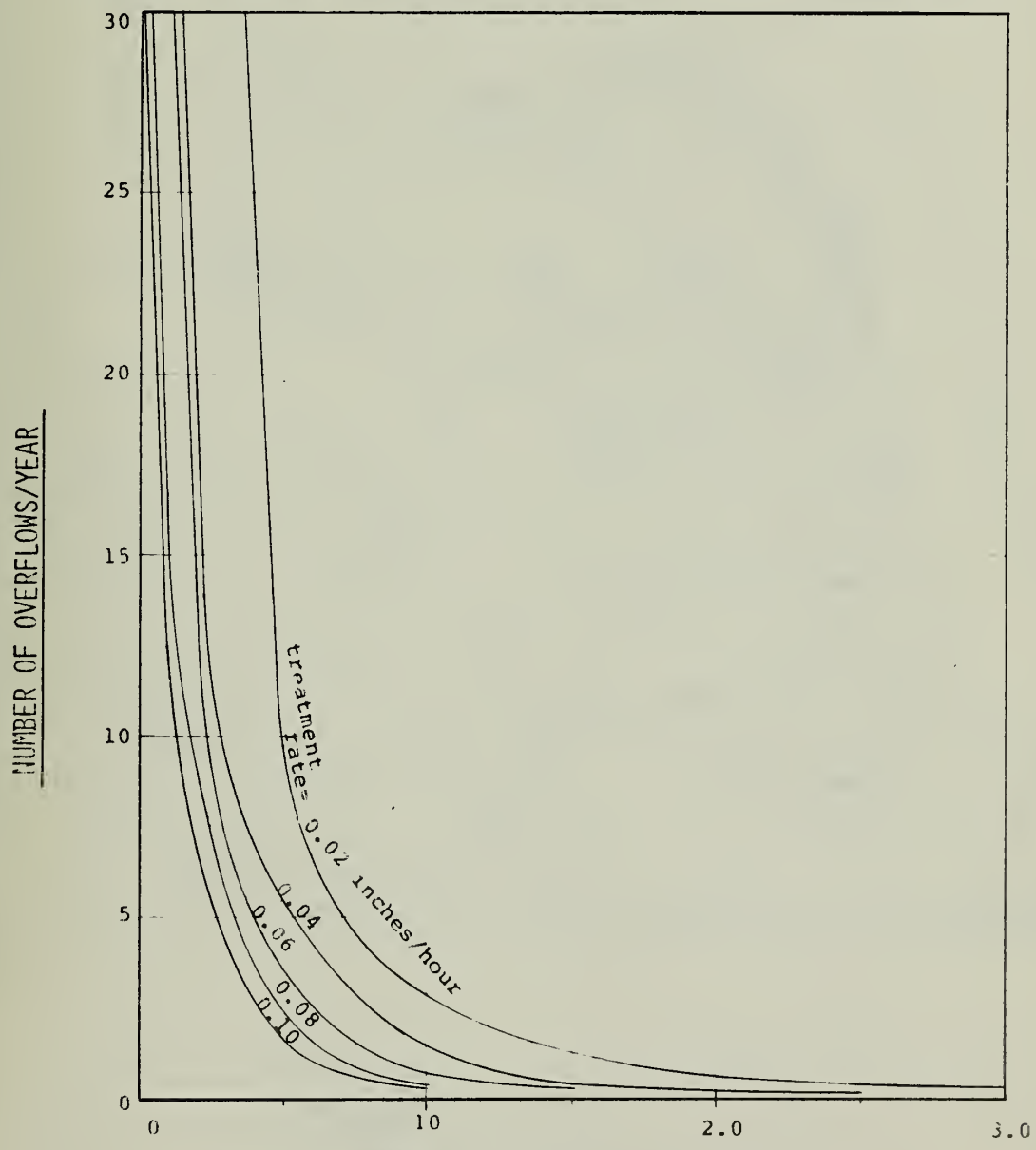


PLATE V-8

LOCATIONS OF SURFACE WATER RUNOFF LOW POINTS

LEGEND

MAIN SEWERS

LOCATION OF SURFACE WATER ACCUMULATION

CITY & COUNTY OF SAN FRANCISCO
SEWERAGE SYSTEM
LAND USE DISTRIBUTION, POPULATION & EMPLOYMENT

SUMMARY FOR NPWPCP

AREA CLASSIFICATION	YEAR	LAND USE (% OF GROSS AREA)				GROSS AREA (ACRES)	HOUSING		POPULATION (NO. OF PERSONS)	EMPLOYMENT (NO. OF PERSONS)
		INDUSTRIES & MANUFACTURING	COMMERCIAL, TRANSPORTATION & UTILITIES	RESIDENTIAL	PUBLIC LANDS & ALL OTHERS		SINGLE FAMILY (NO. OF UNITS)	MULTI-FAMILY (NO. OF UNITS)		
MONITORED AREAS	1965	15.12	17.81	44.31	22.76	(7894)	20043	143756	343179	430171
	1990	14.55	25.32	30.05	30.08	(7894)	16076	171314	423842	631369
NON-MONITORED AREAS	1965	16.36	2.24	10.25	71.15	(1433)	569	3888	10657	19725
	1990	15.56	4.63	8.96	70.85	(1433)	551	3853	10977	27217
TOTAL AREA	1965	15.31	15.42	39.08	30.19	(9327)	20612	147644	453836	449896
	1990	14.71	22.14	26.81	36.34	(9327)	16627	175167	434819	658586

PLATE V-9

CITY & COUNTY OF SAN FRANCISCO
SEWERAGE SYSTEM
LAND USE DISTRIBUTION, POPULATION & EMPLOYMENT

SUMMARY FOR RSWPCP

AREA CLASSIFICATION	YEAR	LAND USE (% OF GROSS AREA)				GROSS AREA (ACRES)	HOUSING		POPULATION (NO. OF PERSONS)	EMPLOYMENT (NO. OF PERSONS)
		INDUSTRIES & MANUFACTURING	COMMERCIAL, TRANSPORTATION & UTILITIES	RESIDENTIAL	PUBLIC LANDS & ALL OTHERS		SINGLE FAMILY (NO. OF UNITS)	MULTI-FAMILY (NO. OF UNITS)		
MONITORED AREAS	1965	2.01	4.53	64.13	29.33	(8904)	50197	29996	215958	47390
	1990	2.18	6.32	61.54	29.96	(8904)	50481	30555	225793	77984
NON-MONITORED AREAS	1965	0	0.47	6.57	92.96	(1499)	521	759	4070	2126
	1990	0	0.60	6.40	93.00	(1499)	545	677	4072	3124
TOTAL AREA	1965	1.72	3.94	55.84	38.50	(10403)	50718	30755	220028	49516
	1990	1.87	5.49	53.60	39.04	(10403)	51026	31232	229865	81108

PLATE V 10

CITY & COUNTY OF SAN FRANCISCO
SEWERAGE SYSTEM
LAND USE DISTRIBUTION, POPULATION & EMPLOYMENT

SUMMARY FOR SEWPCP

AREA CLASSIFICATION	YEAR	LAND USE (% OF GROSS AREA)				GROSS AREA (ACRES)	HOUSING		POPULATION (NO. OF PERSONS)	EMPLOYMENT (NO. OF PERSONS)
		INDUSTRIES & MANUFACTURING	COMMERCIAL, TRANSPORTATION & UTILITIES	RESIDENTIAL	PUBLIC LANDS & ALL OTHERS		SINGLE FAMILY (NO. OF UNITS)	MULTI-FAMILY (NO. OF UNITS)		
MONITORED AREAS	1965	12.44	4.32	48.76	34.48	(7201)	33769	14752	147816	42739
	1990	15.17	9.45	42.74	32.64	(7201)	31674	17408	150648	63901
NON-MONITORED AREAS	1965	14.06	1.39	17.78	66.77	(1577)	1666	3076	18435	14513
	1990	18.30	4.77	14.09	62.84	(1577)	1560	2579	17758	19308
TOTAL AREA	1965	12.73	3.80	43.19	40.28	(8778)	35435	17828	166251	57252
	1990	15.73	8.61	37. 59	38.07	(8778)	33234	19987	168406	83209

PLATE V-11

CITY & COUNTY OF SAN FRANCISCO
SEWERAGE SYSTEM
LAND USE DISTRIBUTION, POPULATION & EMPLOYMENT

SUMMARY FOR TOTAL CITY

AREA CLASSIFICATION	YEAR	LAND USE (% OF GROSS AREA)				GROSS AREA (ACRES)	HOUSING		POPULATION (NO. OF PERSONS)	EMPLOYMENT (NO. OF PERSONS)
		INDUSTRIES & MANUFACTURING	COMMERCIAL, TRANSPORTATION & UTILITIES	RESIDENTIAL	PUBLIC LANDS & ALL OTHERS		SINGLE FAMILY (NO. OF UNITS)	MULTI-FAMILY (NO. OF UNITS)		
MONITORED AREAS	1965	9.45	8.84	53.00	28.71	(23999)	104009	188504	706953	520300
	1990	10.15	13.51	45.54	30.80	(23999)	98231	219277	800283	773254
NON-MONITORED AREAS	1965	10.12	1.35	11.66	76.87	(4509)	2756	7723	33162	36364
	1990	11.35	3.34	9.90	75.41	(4509)	2656	7109	32807	49649
TOTAL AREA	1965	9.56	7.65	46.46	36.33	(28508)	106765	196227	740115	556664
	1990	10.34	11.90	39.90	37.86	(28508)	100887	226386	833090	822903

PLATE V-12

PLATE V-13

AVERAGE DRY WEATHER EFFLUENT FLOW & WATER DEMAND PROJECTION

YEAR	W.D. AVERAGE DAILY WATER DEMAND-1971 B&C (MGD)	CITY PLANNING POPULATION (NO. OF PERSONS)	WATER DEPT. CONSUMPTIVE RATE (GPCD)	DSE - WPCP's[3] EFFLUENT CONSUMPTIVE RATE (GPCD)	TOTAL WPCP's[4] EFFLUENT FLOW (MGD)
1970	111	711,276	156	140	100
1975	109	703,712	155	147	104
1980	119	710,050	168	156	111
1990	125	755,572	166	153	115
2000	128	760,000[2]	168[1]	155	118
2010	131	770,000[2]	170[1]	158	122
2020	134	780,000[2]	172[1]	160	125

(1) Water Department consumptive rate gallons per capita per day "GPCD" was plotted utilizing a method of best fit and projected from 1990 to 2020.

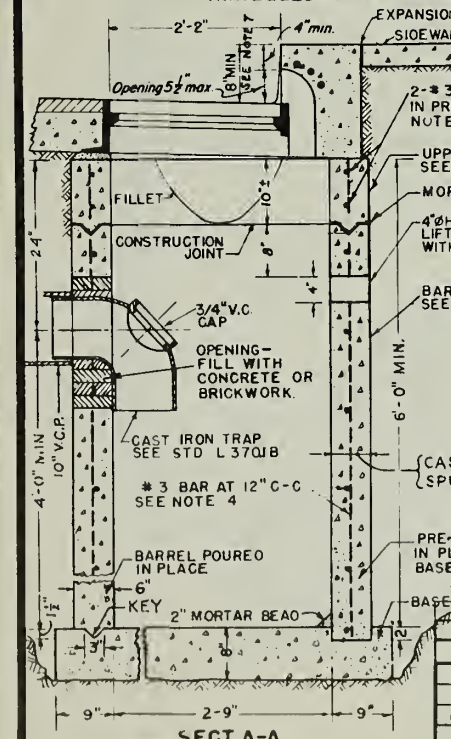
(2) Calculated by dividing the Water Department's Gross average daily water demand by gpcd rates.

(3) An effluent consumptive rate curve gallon per capita per day "gpcd" was developed by utilizing a 7% differential from water demand gpcd rates.

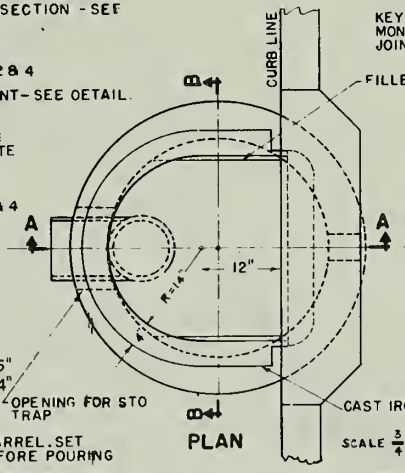
(4) WPCP's total effluent flow in MGD was computed by multiplying the City Planning's population by the WPCP "gpcd" rates.

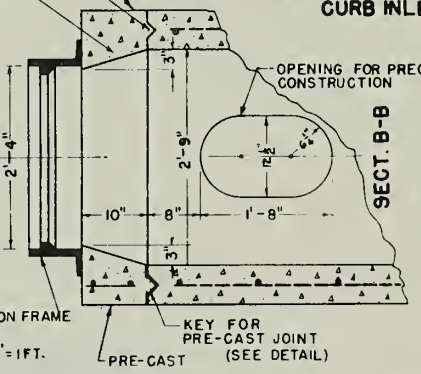
NOTE

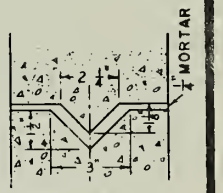
1- BARREL OF C.B. MAY BE PRE-CAST CONCRETE WITH REINFORCING STEEL AS SHOWN, OR POURED IN PLACE WITHOUT STEEL.
2- UPPER RING OF C.B MAY BE PRE-CAST CONCRETE WITH MATCHING KEY AS SHOWN OR POUREO IN PLACE WITHOUT STEEL, OR CONSTRUCTEO OF BRICK.
3- FOR OETAILS OF CATCH BASIN FRAME & GRATING SEE STO. LL-360.1 CH.1
4- 4"X4" MESH NO.4 X NO.4 WIRES MAY BE SUBSTITUTEO FOR REINFORCING BARS.
5- BASE SHALL BE CONCRETE POUREO IN PLACE.
6- ALL CONCRETE SHALL BE CLASS "B"
7- FRAME & GRATES OF CATCHBASINS TO BE INSTALLED IN TRAVELLED LANES SHALL CONFORM TO GUTTER ELEVATION.

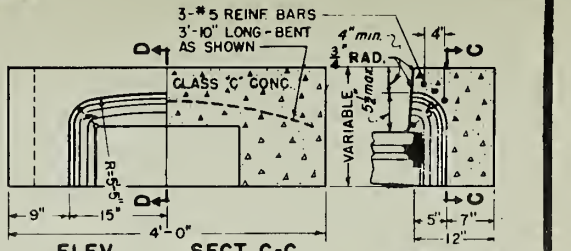


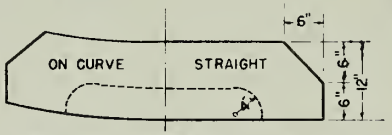
SECT. A-A











CURB INLET DETAILS

SCALE ¾" = 1FT.

NO.	DATE	DESCRIPTION	BY
6	12-26-68	ADDED NOTE 7	K.O.
5	4-11-62	PRE-CAST BARREL THICKNESS & NOTE 3	L.S.
4	4-6-59	MINIMUM VERTICAL DIMENSIONS	L.S.
3	11/30/54	REINFORCING STEEL DESIGNATION	E.B.M.
2	6/13/49	5 1/2" MAX. CURB OPENING	N.G.K.
1	1/2/47	STEEL DELETED WHERE CONCRETE POURED IN PLACE	[illegible]
1	1/2/47	BASE POURED IN PLACE, 8" THICK. KEYS SHOWN	[illegible]

TABLE OF CHANGES
CAUTION: CHECK WITH TRACING TO SEE IF YOU HAVE LATEST REVISION

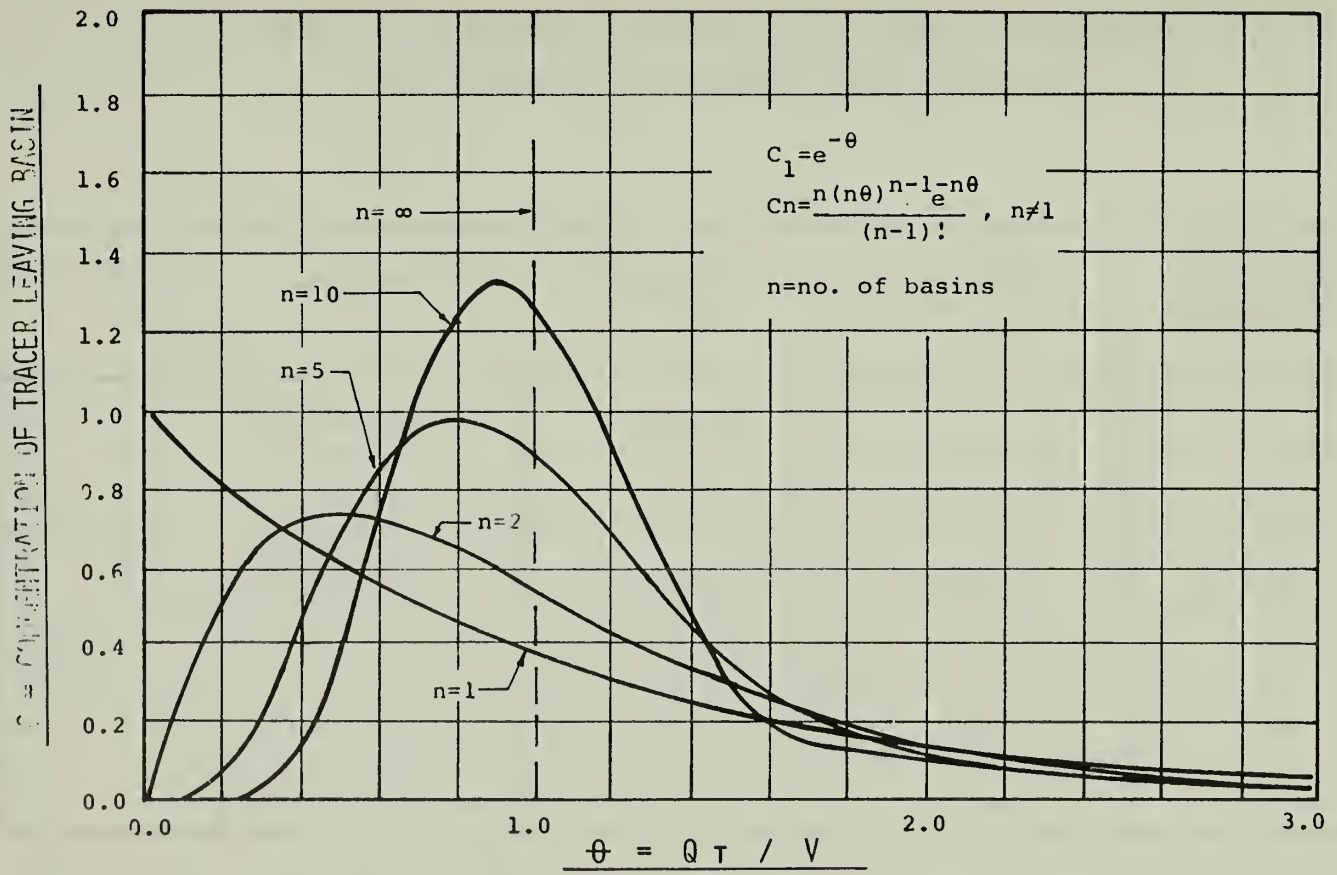
STANDARD DETAILS FOR SEWERS

CITY AND COUNTY OF SAN FRANCISCO
DEPARTMENT OF PUBLIC WORKS - BUREAU OF ENGINEERING

STANDARD CONCRETE CATCH BASIN
WITH CURB INLET AND CAST IRON TRAP

APPROVED	DRAWN BY G.E.D.	DATE	FILE	CHANGE
Ralph J. Wadsworth	TRACED BY [illegible]	APRIL 1946	LL-18039	6
CITY ENGINEER	CHECKED BY A.F.L.			

PLATE V-14



DISPERSION CURVES FOR COMPARTMENTALIZED MIXING BASINS

PLATE V-15

COMPARISON OF SEPARATE STORM SYSTEM CONSTITUENT CONCENTRATIONS

TO SAN FRANCISCO "DUE TO STORM" MEAN CONCENTRATIONS

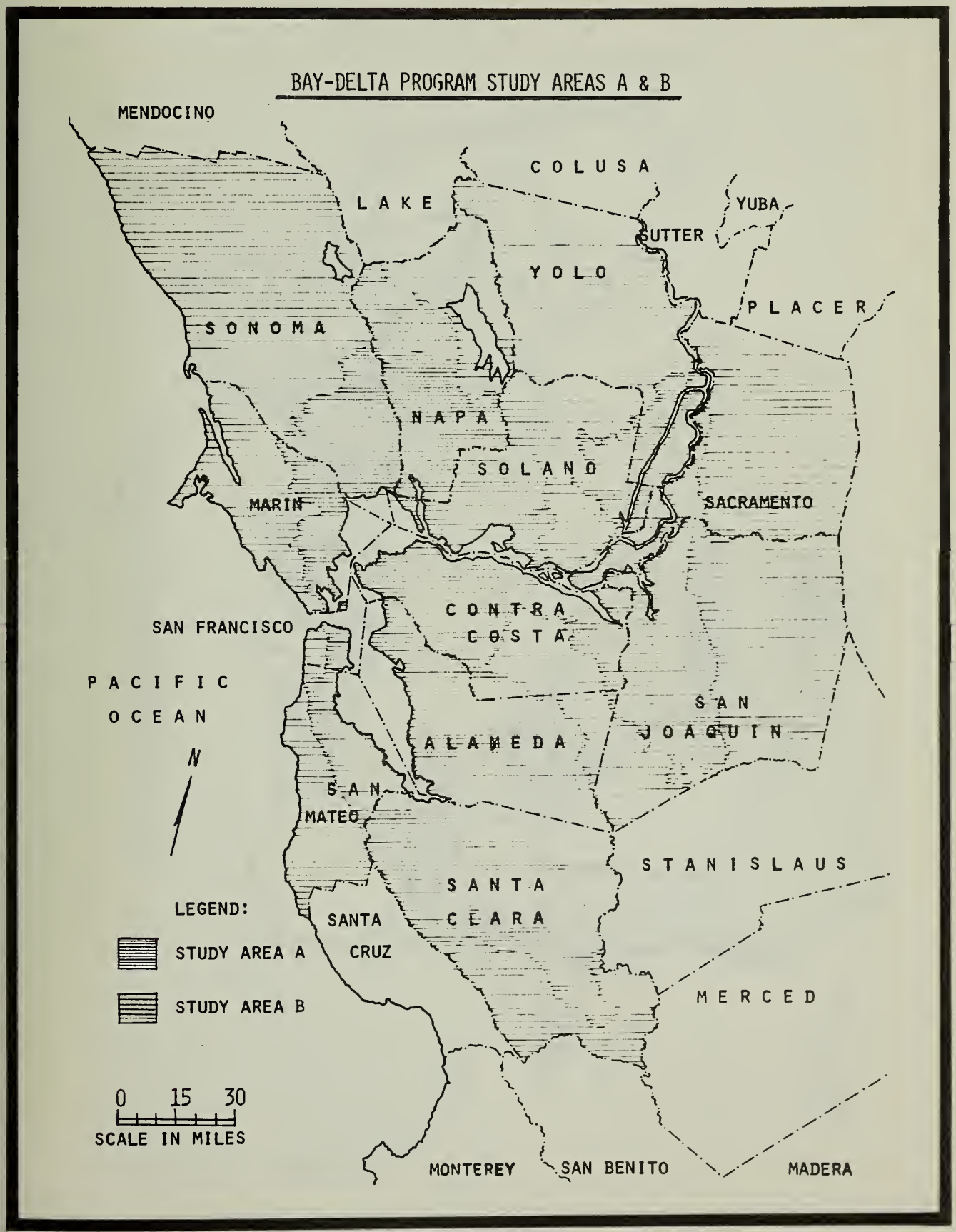
CONSTITUENTS	CINCINNATI[1] OHIO	OAKLAND[1] CALIFORNIA	SAN FRANCISCO "DUE TO STORM"	SAN FRANCISCO[2] COMBINED SEWER OVERFLOW ÷ R
BOD	12-28 ppm	87 ppm avg.	-	-
COD	72-170 ppm	-	185 ppm	115 ppm
TSS	160-390 ppm	613 ppm avg.	448 ppm	424 ppm
GREASE	-	32 ppm avg.	18 ppm	-
TN	2.3 - 3.6 ppm	-	9 ppm	7 ppm
PO_4	0.63 - 0.99 ppm	-	1.5 ppm	4 ppm

(1) Ref: Characteristics of combined sewer overflows

(2) R = Reported ratio of mean concentrations: combined sewer overflows/urban surface runoff.

PLATE V-16

PLATE V-17


BAY-DELTA PROGRAM STUDY AREAS A & B
MENDOCINO
LAKE
COLUSA
YUBA
SUTTER
YOLO
PLACER
SONOMA
NAPA
SOLANO
MARIN
SACRAMENTO
CONTRA COSTA
SAN FRANCISCO
PACIFIC OCEAN
SAN JOAQUIN
ALAMEDA
N
SAN MATEO
STANISLAUS
SANTA CLARA
LEGEND:
SANTA CRUZ
STUDY AREA A
STUDY AREA B
MERCED
0 15 30
SCALE IN MILES
MONTEREY
SAN BENITO
MADERA

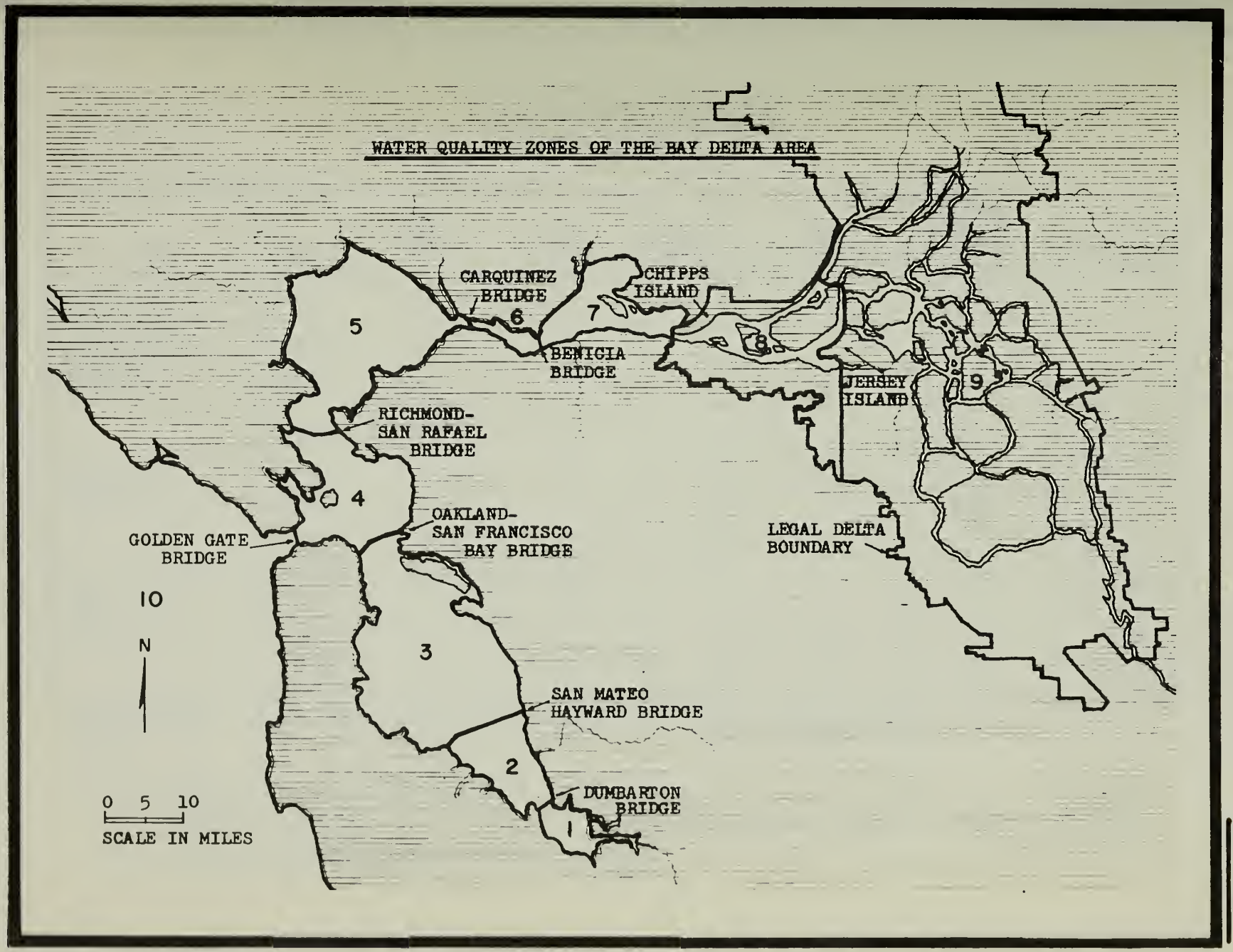

WATER QUALITY ZONES OF THE BAY DELTA AREA
CARQUINEZ BRIDGE
CHIPPS ISLAND
BENICIA BRIDGE
JERSEY ISLAND
RICHMOND-SAN RAFAEL BRIDGE
OAKLAND-SAN FRANCISCO BAY BRIDGE
GOLDEN GATE BRIDGE
LEGAL DELTA BOUNDARY
SAN MATEO HAYWARD BRIDGE
DUMBARTON BRIDGE
1
2
3
4
5
6
7
8
9
10
N
0 5 10
SCALE IN MILES

PLATE V-18

RAW POLLUTANTS GENERATED IN
AREAS A & B OF THE BAY-DELTA
AND UPDATED BY S.F. DATA

AREA	SOURCE	FLOW (10^3MG/yr)	BOD (10^6lbs/yr)	TOTAL N (10^6lbs/yr)	TOTAL P (10^6lbs/yr)	TOTAL SUSPENDED SOLIDS (10^6lbs/yr)	OIL & GREASE (10^6lbs/yr)
WQZ 1 to 8 9N, 9S, Stream Runoff and Agricultural Drainage, Area C	M&I	217	750	187	37	466.3	-
	NRO	359	29	6.5	0.90	1,822	-
	Agric.	5,720	-	23	-	-	-
	TOTAL	6,326(1)	779(2)	216.5(2)	37.9	2,288.3	-
WQZ #3 (SEWPCP)(4)	M&I	53.8	209	53.9	11.8	136.8	34.8(3)
	NRO	29.7	5.6	0.57	0.13	90.4	1.93
	TOTAL	83.5	214.6	54.4	11.93	227.2	36.7
WQZ #4 (NPWPCP) (5)	M&I	32.1	105.0	23.7	5.6	4.3	15.2(3)
	NRO	24.5	4.7	0.70	0.21	63.9	1.78
	TOTAL	56.6	109.7	24.4	5.81	138.2	17.1(3)

Abbreviations: WQZ - Water Quality Zone (Plate V-17) NRO - Natural Runoff
M&I - Municipal and Industrial Agric. - Agricultural

Notes:
(1) Includes 30 x 10^3 MG/year from Area C.
(2) Exluding BOD or nitrogen discharged outside of A & B.
(3) Estimated by assuming all the BOD to be of Municipal origin and applying the ratio of grease to BOD of 0.025/0.17
(4) The WQZ in which the Southeast WPCP discharges.
(5) The WQZ in which the North Point WPCP discharges.

FLOATING DEBRIS ON SAN FRANCISCO BAY

AVERAGE MONTHLY TONNAGES REMOVED BY THE
U.S.A.-CORP OF ENGINEERS
(AVERAGE BASED UPON 1963 THRU 1970 TIME PERIODS)

REF: PERS. COMM. U.S. ARMY CORPS OF ENGINEERS

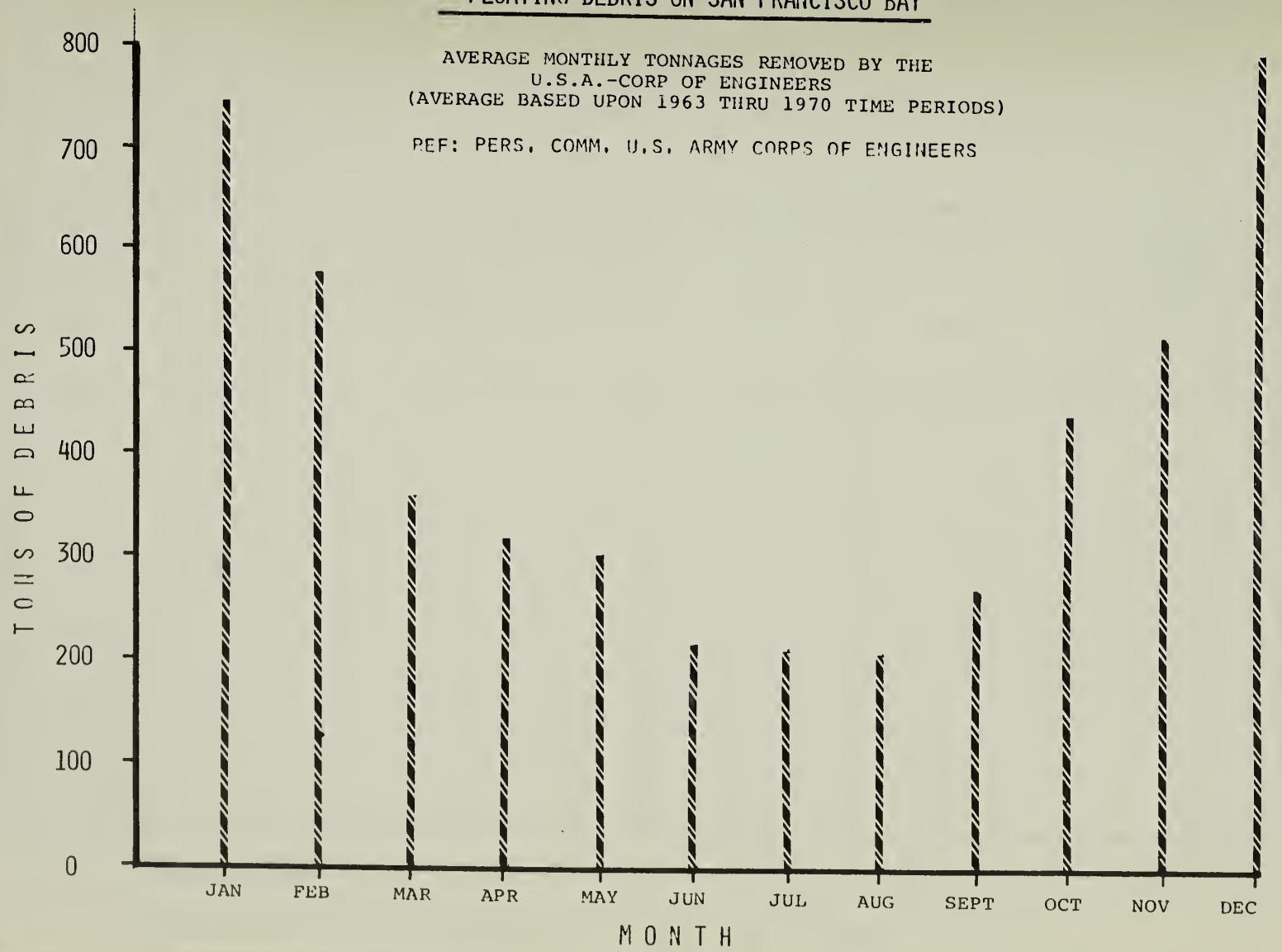


PLATE V-20

PERCENTAGE CONTROL OF

WET WEATHER OVERFLOW VOLUMES(1)

NUMBER OF OVERFLOWS PER YEAR	AVERAGE TOTAL HOURS OF OVERFLOW PER YEAR	PERCENT TIME OVERFLOW OCCURS PER YEAR	PERCENT OF CONTROLLED RUNOFF(2)	PERCENT OF OVERFLOW	VOLUME OF UNCONTROLLED RUNOFF FOR TOTAL CITY ($\times 10^9$ GALS.)
82	206	2.350	32.0	68.0	6
8	16	0.183	92.5	7.5	0.75
4	8	0.091	95.9	4.1	0.36
1	3	0.034	98.9	1.1	0.09
1/2	1.5	0.017	99.5	0.5	0.04
1/5	0.8	0.009	99.8	0.2	0.02
1/20	-	-	99.95	0.05	0.004

(1) Annual Averages

(2) Based upon Treatment Rate of 0.10 inch per hour of Equivalent Rainfall

PLATE V-21

COMPARISON OF ANNUAL RAW MASS
EMISSIONS UNDER CONTROLLED CONDITIONS
CITY AND COUNTY OF SAN FRANCISCO

Zone	Constituent	EMISSIONS IN POUNDS x 10^3							
		Dry Weather	Due to Storm	Total Raw	Combined Sewer Overflow Portion of Total (1)				
					8 o.f./yr.	4 o.f./yr.	1 o.f./yr	1/2 o.f./yr	1/5 o.f./yr
NPWPCP	COD	112,000	5,000	117,000	579.96	306.92	93.08	44.04	20.08
	TSS	32,400	12,000	44,400	959.29	521.48	143.02	65.50	26.91
	TN	6,200	250	6,450	30.10	15.89	4.86	2.30	1.05
	OPP	5,100	42	5,142	12.48	6.36	2.19	1.07	0.54
	MBAS	10,800	485	11,285	56.14	29.72	9.01	4.26	1.94
	Floatables	584	100	684	8.57	4.63	1.30	0.59	0.25
RSWPCP	COD	33,600	4,300	37,900	383.98	206.88	58.72	27.21	11.62
	TSS	10,800	10,400	21,200	799.76	436.23	118.070	53.83	21.77
	TN	2,300	215	2,515	20.34	10.91	3.15	1.46	0.63
	OPP	2,200	36	2,236	6.73	3.48	1.15	0.55	0.27
	MBAS	2,900	420	3,320	36.81	19.86	5.62	2.59	1.10
	Floatables	190	87	277	6.88	3.74	1.02	0.46	0.19
SLWPCP	COD	42,000	4,200	46,200	391.86	210.42	60.48	28.14	12.18
	TSS	20,400	10,100	30,500	794.83	432.66	118.04	53.96	22.03
	TN	2,900	208	3,108	20.91	11.17	3.28	1.53	0.67
	OPP	1,800	34	1,834	5.84	3.03	0.98	0.47	0.23
	MBAS	7,200	405	7,605	43.56	23.16	6.91	3.24	1.45
	Floatables	197	83	280	6.59	3.58	0.98	0.44	0.18
Total City	COD	187,600	13,500	201,100	1355.80	724.22	212.28	99.39	43.88
	TSS	63,600	32,500	96,100	2553.88	1390.37	379.13	173.31	70.72
	TN	11,400	673	12,073	71.35	37.97	11.29	5.30	2.37
	OPP	9,100	112	9,212	25.05	12.87	4.32	2.10	1.04
	MBAS	20,900	1,310	22,210	136.51	72.74	21.54	10.10	4.50
	Floatables	971	270	1,241	22.04	11.95	3.30	1.51	0.62
	Flow	35,900 MG	8,800 MG	44,700 MG					
Percent of Runoff Overflowing					7.5	4.1	1.1	0.5	0.2
Percent of Total Year Overflow Occurs					0.183	0.091	0.034	0.017	0.009

(1) Calculated as: "Due to Storm Emission" x % Runoff Overflowing / 100
+ "Dry Weather Emission" x % Time Overflowing / 100

PLATE V-22

COMPARISON OF DAILY AVERAGE MASS
EMISSIONS UNDER CONTROLLED CONDITIONS
CITY & COUNTY OF SAN FRANCISCO

Zones	Constituent	EMISSIONS IN POUNDS x 10^3										
		Avg. Dry Weather Day to Treat. Plant (1)	AVERAGE WET WEATHER DAY EMISSIONS (2)									
			TO TREATMENT PLANT					TO OVERFLOW				
			8 of/yr	4 of/yr	1 of/yr	½ of/yr	1/5 of/yr	8 of/yr	4 of/yr	1 of/yr	½ of/yr	1/5 of/yr
NPWPCP	COD	307.0	2531	2537	2542	2543	2543	72.5	76.7	93.1	88.1	100.4
	TSS	89.0	944	954	962	964	965	119.9	130.4	143.0	131.0	134.6
	TN	17.0	140	140	140	140	140	3.8	4.0	4.9	4.6	5.3
	OPP	14.0	111	112	112	112	112	1.6	1.6	2.2	2.2	2.7
	HEM	29.6	244	245	245	245	245	7.0	7.4	9.0	8.5	9.7
	Floatables	1.6	15	15	15	15	15	1.1	1.2	1.3	1.2	1.3
RSWPCP	COD	92.0	815.6	819.4	822.6	823.3	823.7	48.0	51.7	58.7	54.4	58.1
	TSS	30.0	443.5	451.4	458.3	459.7	460.4	100.0	109.1	118.1	107.7	108.9
	TN	6.3	54.2	54.4	54.6	54.6	54.7	2.5	2.7	3.2	2.9	3.2
	OPP	6.0	48.5	48.5	48.6	48.6	48.6	0.8	0.9	1.2	1.1	1.4
	HEM	7.9	71.4	71.7	72.1	72.1	72.1	4.6	5.0	5.6	5.2	5.5
	Floatables	0.5	5.9	5.9	6.0	6.0	6.0	0.9	0.9	1.0	0.9	1.0
SEWPCP	COD	115.0	995.8	999.8	1003	1004	1004	49.0	52.6	60.5	56.3	60.9
	TSS	56.0	645.8	653.6	660.5	661.9	662.6	99.4	108.2	118.0	107.9	110.2
	TN	7.9	67.1	67.3	67.5	67.5	67.6	2.6	2.8	3.3	3.1	3.4
	OPP	4.9	39.7	39.8	39.8	39.9	39.9	0.7	0.8	1.0	1.0	1.2
	HEM	19.7	164.4	164.8	165.2	165.3	165.3	5.4	5.8	6.9	6.5	7.3
	Floatables	0.5	6.0	6.0	6.1	6.1	6.1	0.8	0.9	1.0	0.9	0.9
Total City	COD	514.0	4343	4356	4368	4370	4371	169.5	181.0	212.3	198.8	219.4
	TSS	175.0	2033	2059	2081	2086	2088	319.3	347.7	379.1	346.6	353.7
	TN	31.2	261	262	262	262	262	8.9	9.5	11.4	10.6	11.9
	OPP	24.9	199	200	200	201	201	3.1	3.3	4.4	4.3	5.3
	HEM	57.2	480	482	482	482	482	17.0	18.2	21.5	20.2	22.5
	Floatables	2.6	27	27	27	27	27	2.8	3.0	3.3	3.0	3.2

(1) Average dry weather day emissions is equal to 1/365 of annual dry weather emissions.

(2) Average wet weather day emissions to:
Overflow is equal to annual combined sewer overflow portion ÷ no. of overflow per year
Treatment plant is equal to 1/46 of (total raw emissions - combined sewer overflow portion)

PLATE V-23

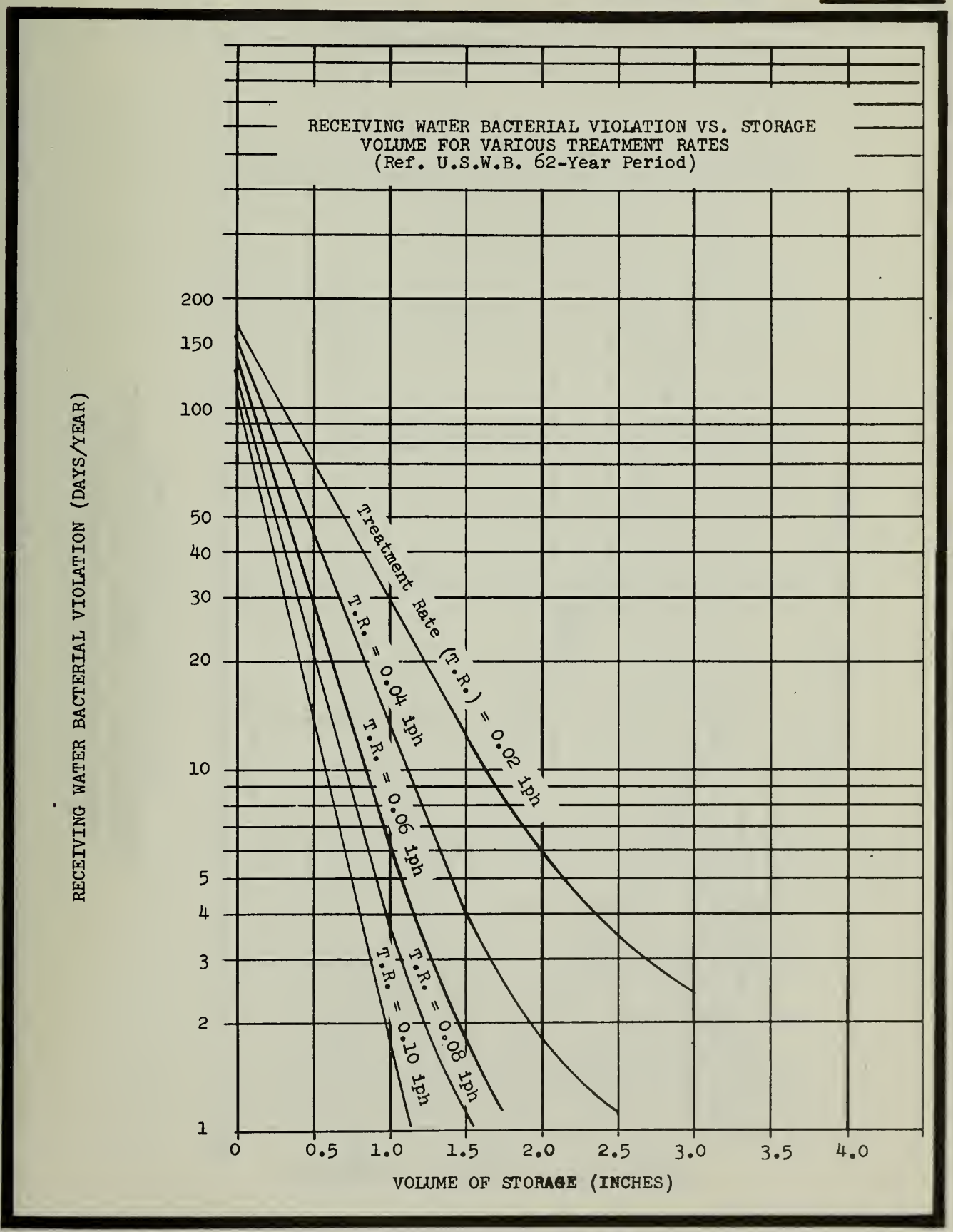
PLATE V-24

NUMBER OF DAYS & MONTHS OF RECEIVING WATER
VIOLATION DUE TO COMBINED SEWER OVERFLOWS
(BASED ON 62-YEAR RAINFALL RECORD OF U.S.W.B., S.F.)

TREATMENT RATE (INCHES/HR)	STORAGE VOLUME (INCHES)	RECEIVING WATER VIOLATIONS			
		TOTAL DAYS IN 62 YEARS	AVERAGE DAYS PER YR.	TOTAL MONTHS IN 62 YEARS	AVERAGE MONTHS PER YR.
0.02	4.00	20	0.32	2	0.03
0.02	3.50	60	0.97	6	0.10
0.02	3.00	150	2.42	15	0.24
0.02	2.50	240	3.87	23	0.37
0.02	2.00	368	5.94	35	0.56
0.02	1.50	768	12.39	68	1.10
0.02	1.00	1823*	29.40*	143	2.31
0.02	0.50	4371*	70.50*	274	4.42
0.02	0.00	10574	170.55	511	8.24
0.04	3.00	10	0.16	1	0.02
0.04	2.50	70	1.13	7	0.11
0.04	2.00	110	1.77	11	0.18
0.04	1.50	249	4.02	23	0.37
0.04	1.00	847	13.67	75	1.21
0.04	0.75	1569*	25.30*	131	2.11
0.04	0.50	2914*	47.00*	212	3.42
0.04	0.25	5332*	86.00*	321	5.18
0.04	0.00	9796*	158.00*	484*	7.80*
0.06	2.00	70	1.13	7	0.11
0.06	1.50	110	1.77	11	0.18
0.06	1.00	392	6.32	37	0.60
0.06	0.75	881	14.21	77	1.24
0.06	0.50	1891*	30.50*	154	2.48
0.06	0.25	4092*	66.00*	282	4.55
0.06	0.00	8825	142.34	458	7.39
0.08	2.00	10	0.16	1	0.02
0.08	1.50	70	1.13	7	0.11
0.08	1.00	230	3.71	23	0.37
0.08	0.75	546	8.81	47	0.76
0.08	0.50	1311	21.15	112	1.81
0.08	0.25	3224*	52.00*	249	4.02
0.08	0.00	7936*	128.00*	433*	6.98*
0.10	1.50	20	0.32	2	0.03
0.10	1.25	50	0.81	5	0.08
0.10	1.00	110	1.77	11	0.18
0.10	0.75	339	5.47	33	0.53
0.10	0.50	924	14.90	76	1.23
0.10	0.25	2542*	41.00*	200	3.23
0.10	0.00	7186	115.90	405	6.53
0.12	0.00	6417*	103.50*	381*	6.15*
0.14	0.00	5735*	92.50*	355*	5.73*
0.16	0.00	5146*	83.00*	330*	5.32*
0.18	0.00	4563*	73.60*	304*	4.90*
0.20	0.00	4052	65.35	265	4.27
0.25	0.00	2877*	46.40*	211*	3.41*
0.30	0.00	1910*	30.80*	148*	2.38*
0.35	0.00	1094	17.65	85	1.37

*-Interpolated Values Based on Plate V-25 and Plate V-26.

PLATE V-25


RECEIVING WATER BACTERIAL VIOLATION VS. STORAGE VOLUME FOR VARIOUS TREATMENT RATES (Ref. U.S.W.B. 62-Year Period)
RECEIVING WATER BACTERIAL VIOLATION (DAYS/YEAR)
200
150
100
50
40
30
20
10
5
4
3
2
1
0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
VOLUME OF STORAGE (INCHES)
Treatment Rate (T.R.) = 0.02 iph
T.R. = 0.04 iph
T.R. = 0.06 iph
T.R. = 0.08 iph
T.R. = 0.10 iph

RECEIVING WATER BACTERIAL VIOLATIONS VS. TREATMENT RATE FOR VARIOUS STORAGE CAPACITY

(REF: U.S.W.B. 62-YEAR RECORD)

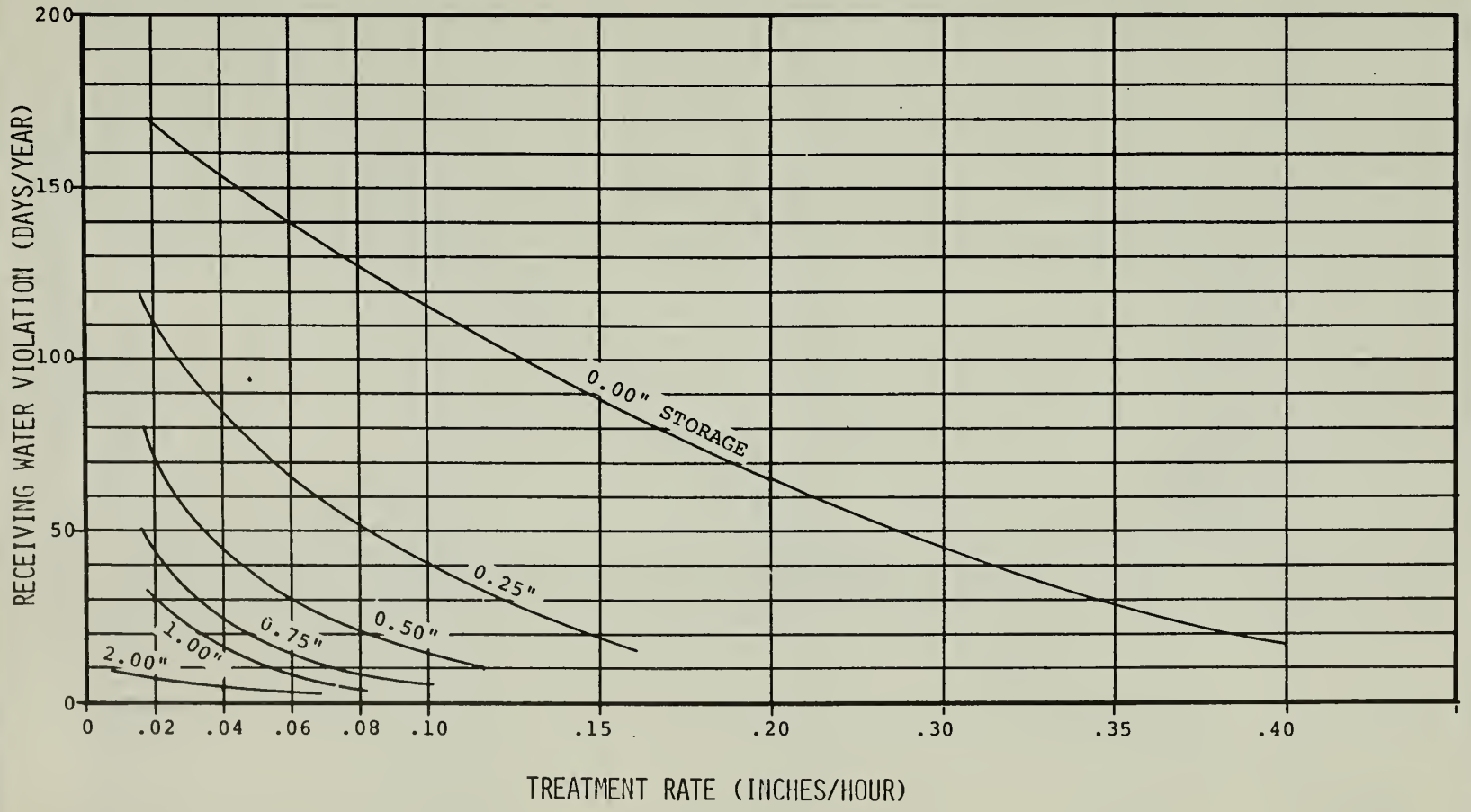


PLATE V-26

PLATE V-27

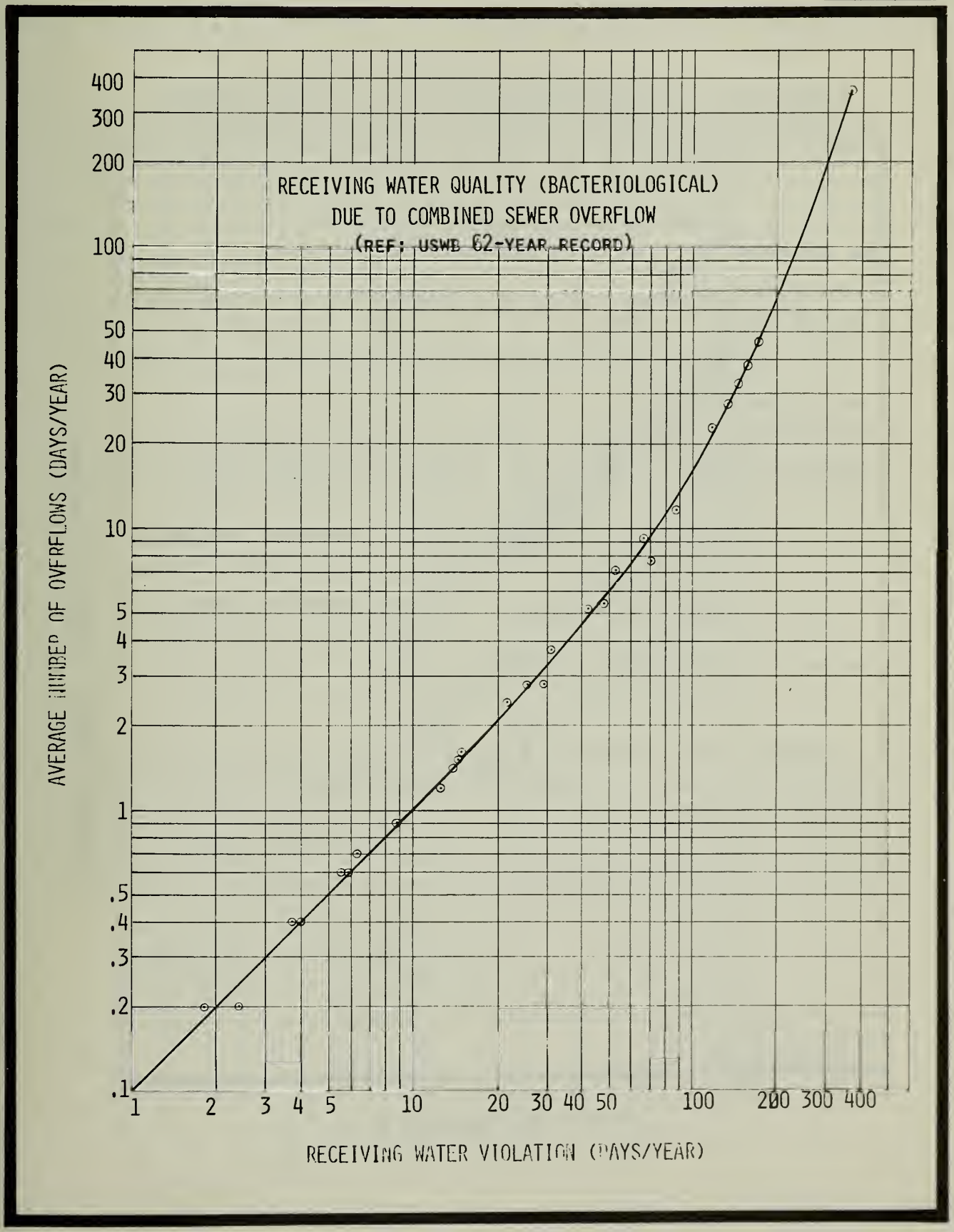

RECEIVING WATER QUALITY (BACTERIOLOGICAL)
DUE TO COMBINED SEWER OVERFLOW
(REF: USWB 62-YEAR RECORD)
AVERAGE NUMBER OF OVERFLOWS (DAYS/YEAR)
RECEIVING WATER VIOLATION (DAYS/YEAR)
400
300
200
100
50
40
30
20
10
5
4
3
2
1
.5
.4
.3
.2
.1
1
2
3
4
5
10
20
30
40
50
100
200
300
400

PLATE V-28

PROJECT COSTS FOR VARIOUS TREATMENT PROCESSES

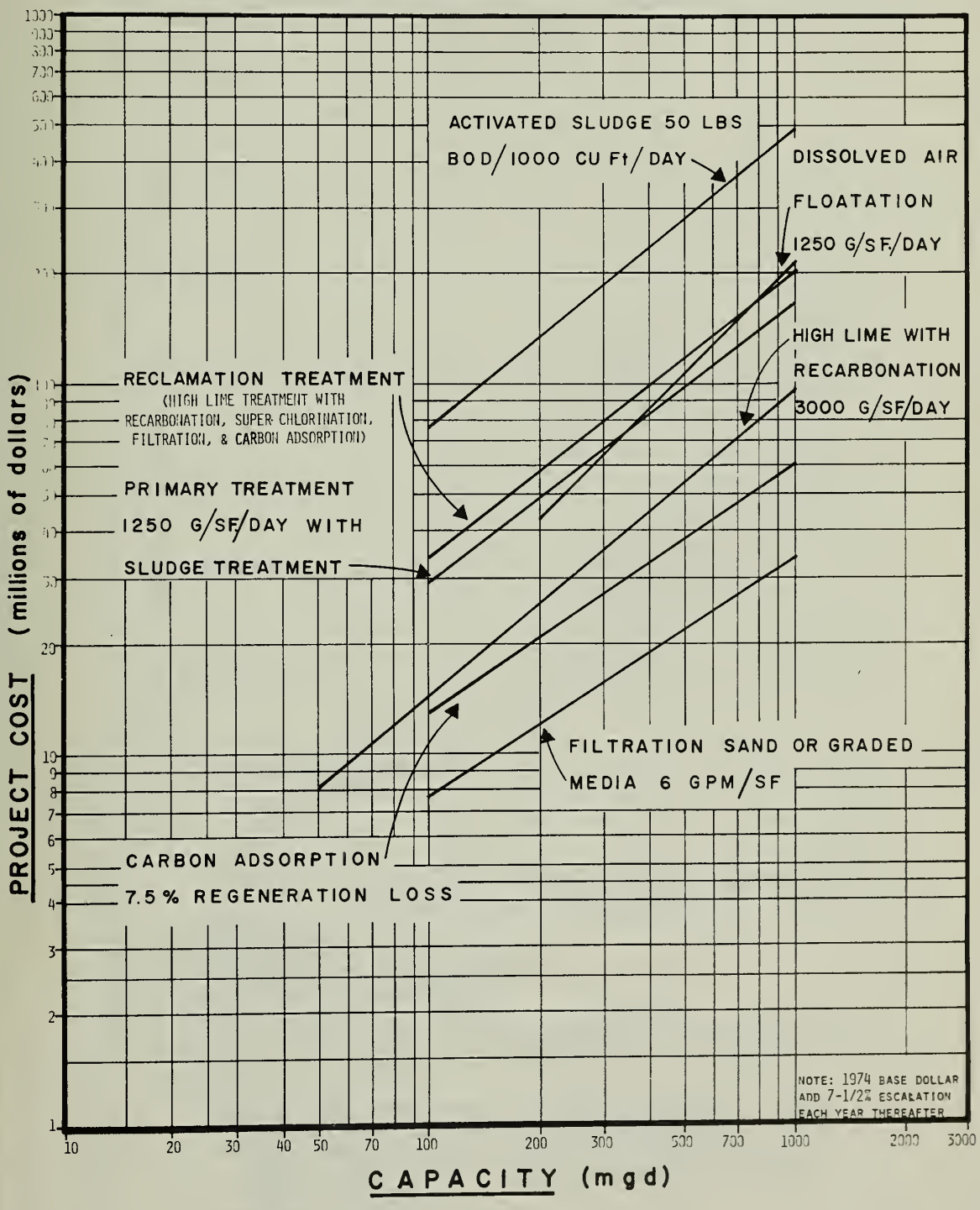
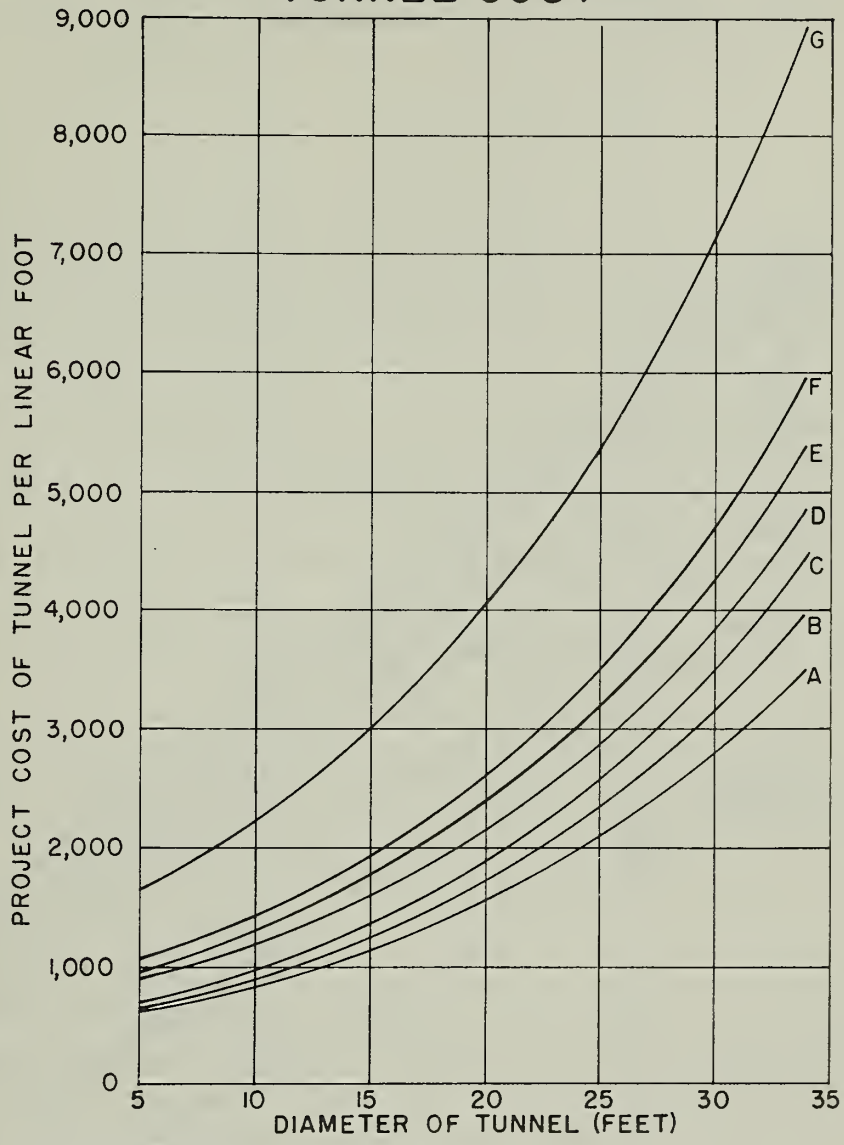

ACTIVATED SLUDGE 50 LBS BOD/1000 CU Ft/DAY
DISSOLVED AIR FLOATATION 1250 G/SF/DAY
HIGH LIME WITH RECARBONATION 3000 G/SF/DAY
RECLAMATION TREATMENT (HIGH LIME TREATMENT WITH RECARBONATION, SUPER CHLORINATION, FILTRATION, & CARBON ADSORPTION)
PRIMARY TREATMENT 1250 G/SF/DAY WITH SLUDGE TREATMENT
FILTRATION SAND OR GRADED MEDIA 6 GPM/SF
CARBON ADSORPTION 7.5% REGENERATION LOSS
NOTE: 1974 BASE DOLLAR AND 7-1/2% ESCALATION EACH YEAR THEREAFTER
PROJECT COST (millions of dollars)
CAPACITY (mgd)
10 20 30 40 50 70 100 200 300 500 700 1000 2000 3000
1 2 3 4 5 6 7 8 9 10 20

PLATE V-29

TUNNEL COST



A. SANDSTONE
B. SAND, COMMON & SANDSTONE
C. CHERT, BASALT, SERPENTIZED PERIDOTITE
D. SANDSTONE, FAULT ZONE
E. SAND
F. CHERT, BASALT, SERPENTIZED PERIDOTITE, FAULT ZONE
G. FILL AREAS UNDER AIR PRESSURE

NOTES:

1. COSTS ARE 1974 BASE DOLLAR. ESCALATE 7½ % PER YEAR, EACH YEAR THEREAFTER.
2. PRICES APPLICABLE TO 5,000 FT. TUNNEL. FOR EACH 1,000 FEET LESS, INCREASE UNIT BID PRICE BY 10%.
3. MINIMUM LENGTH TUNNEL 1,000 FEET.

PLATE V-30

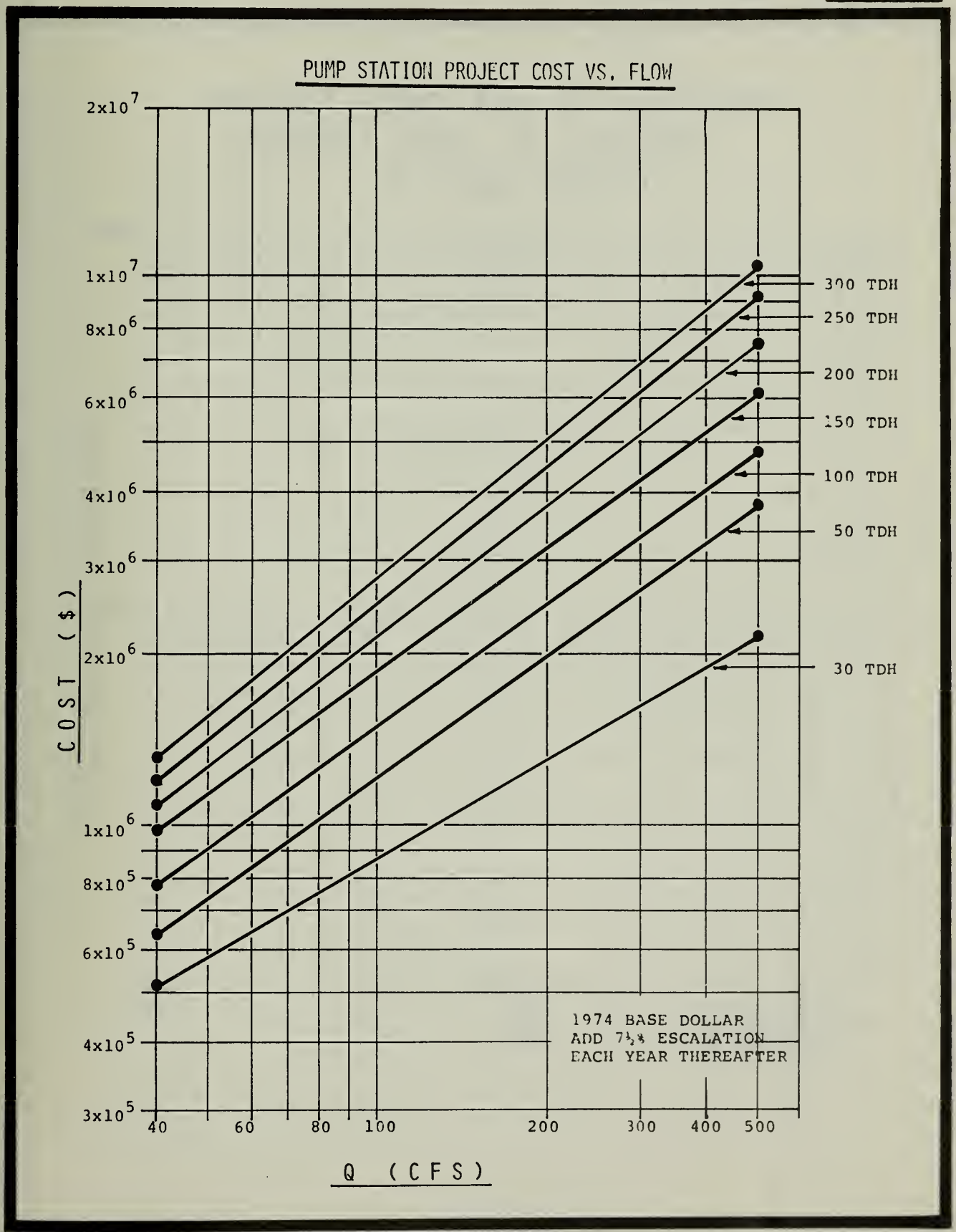
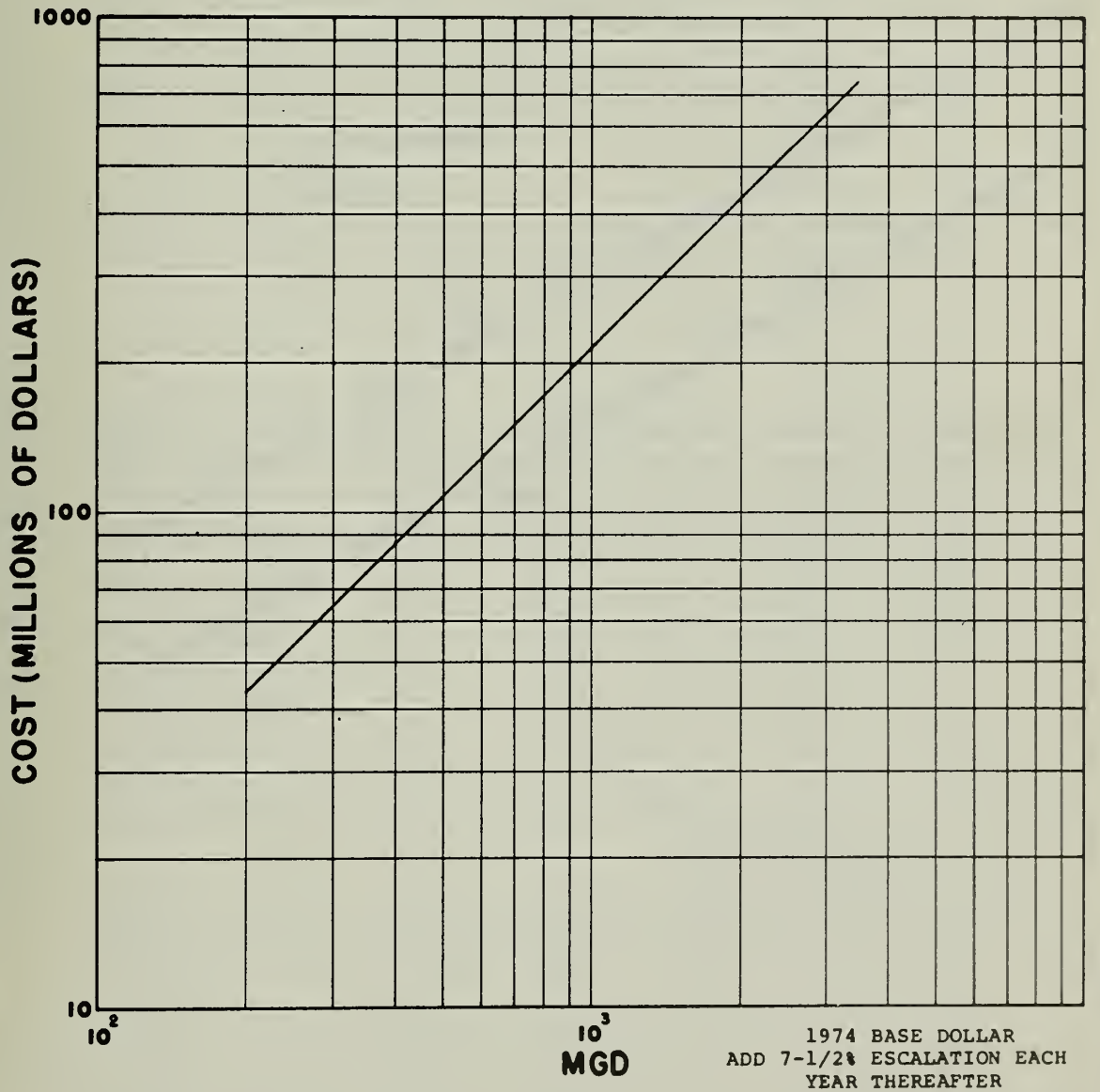

PUMP STATION PROJECT COST VS. FLOW
2x10^7
1x10^7
8x10^6
6x10^6
4x10^6
3x10^6
2x10^6
1x10^6
8x10^5
6x10^5
4x10^5
3x10^5
COST ($)
300 TDH
250 TDH
200 TDH
150 TDH
100 TDH
50 TDH
30 TDH
1974 BASE DOLLAR
ADD 7½% ESCALATION
EACH YEAR THEREAFTER
40
60
80
100
200
300
400
500
Q (CFS)

PLATE V-31

PROJECT COST FOR AIR FLOTATION FACILITY COST VS. CAPACITY AT 1250 GPSFD



1974 BASE DOLLAR
ADD 7-1/2% ESCALATION EACH YEAR THEREAFTER
Rev. 7-14-71

PLATE V-32

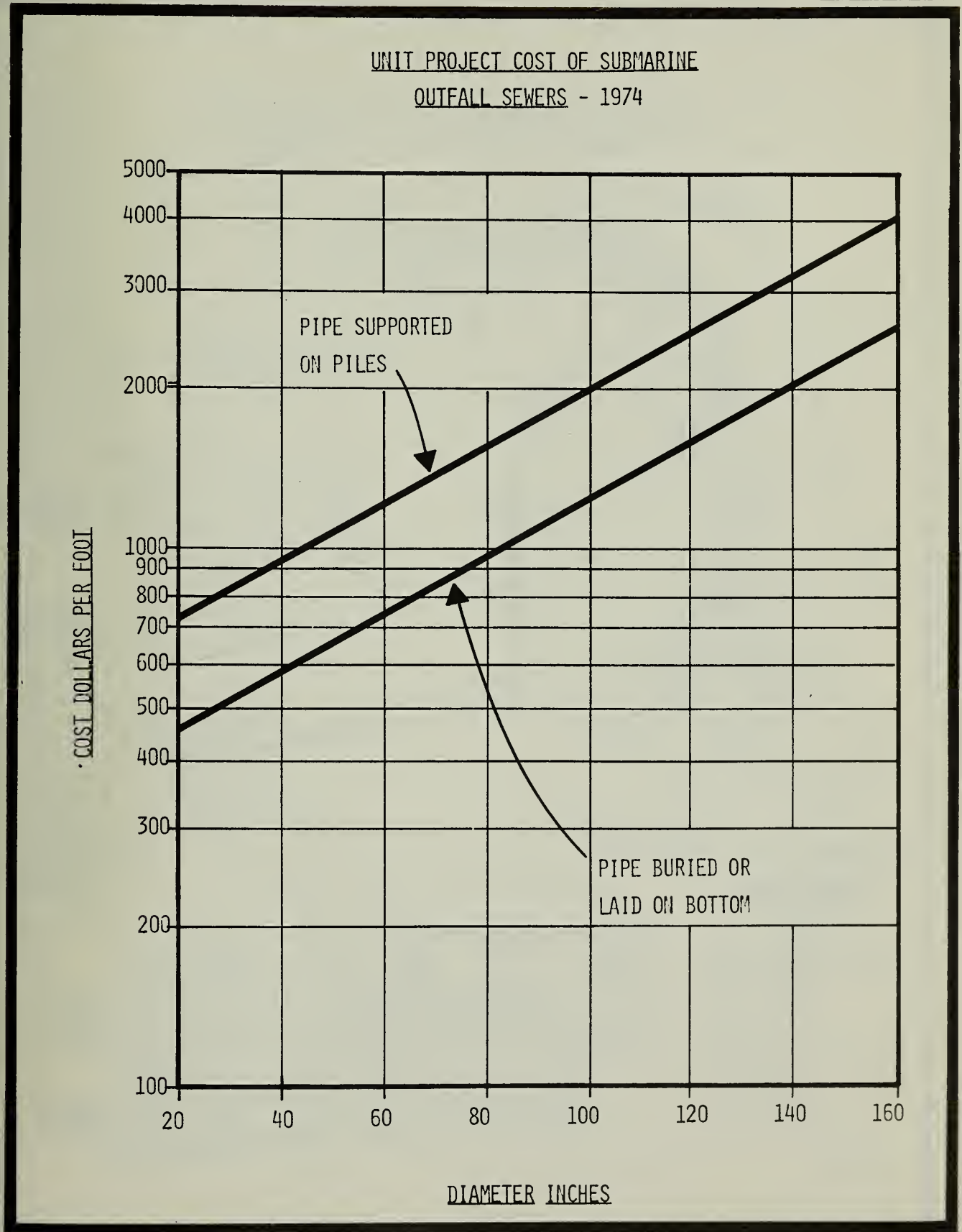
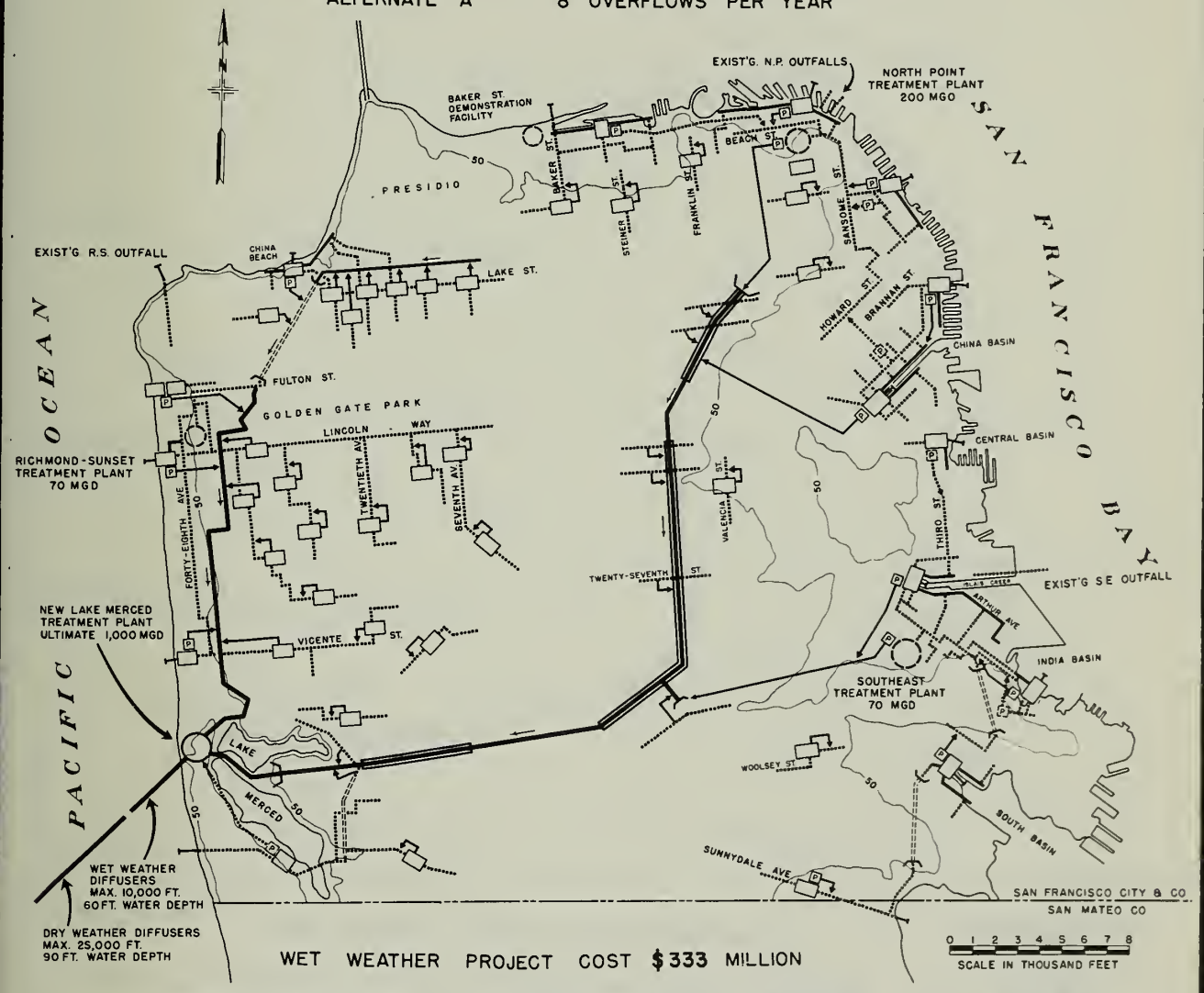

UNIT PROJECT COST OF SUBMARINE
OUTFALL SEWERS - 1974
5000
4000
3000
2000
1000
900
800
700
600
500
400
300
200
100
COST DOLLARS PER FOOT
PIPE SUPPORTED
ON PILES
PIPE BURIED OR
LAID ON BOTTOM
20
40
60
80
100
120
140
160
DIAMETER INCHES

PLATE VI-1

MASTER PLAN FOR WET WEATHER CONTROL

ALTERNATE A 8 OVERFLOWS PER YEAR



WET WEATHER PROJECT COST $333 MILLION

	NUMBER OF OVERFLOW LOCATIONS	AVERAGE NUMBER OF OVERFLOWS PER YEAR	DURATION IN HOURS	TOTAL HOURS PER YEAR	VOLUME OF † UNTREATED OVERFLOW DISCHARGE (BILLIONS OF GALLONS)			VOLUME OF † TREATED DISCHARGE (BILLIONS OF GALLONS)			DAYS RECEIVING WATERS EXCEEDS BACTERIAL STANDARDS (PER YEAR)
					OCEAN	BAY	TOTAL	OCEAN	BAY	TOTAL	
EXISTING	43	82	2.5	205	2.0	4.0	6.0	8.2	30.6	38.8	171.0
ALTERNATE A	15	8	2.0	16	0.25	0.5	0.75	44.1	NIL	44.1	40.0-80.0
% REDUCED		90%		92%	87.5%	87.5%	87.5%				53.0-76.5%

	SUSPENDED SOLIDS (MILLIONS OF POUNDS/YEAR)	COD (MILLIONS OF POUNDS/YEAR)	GREASE (MILLIONS OF POUNDS/YEAR)	FLOATABLES (MILLIONS OF POUNDS/YEAR)	NITROGEN (MILLIONS OF POUNDS/YEAR)	PHOSPHATE (MILLIONS OF POUNDS/YEAR)
EXISTING	41.7	125.6	10.8	0.47	10.4	4.75
ALTERNATE A	14.3	81.2	3.5	0.33	9.7	1.40
% REDUCED	65.5%	35.5%	68.0%	30.0%	7.0%	70.5%

† GOLDEN GATE BRIDGE-DIVIDING BOUNDARY

@ CHEMICAL SEDIMENTATION

LEGEND

DASHED LINES DENOTE EXIST'G FACILITIES
SOLID LINES DENOTE NEW FACILITIES

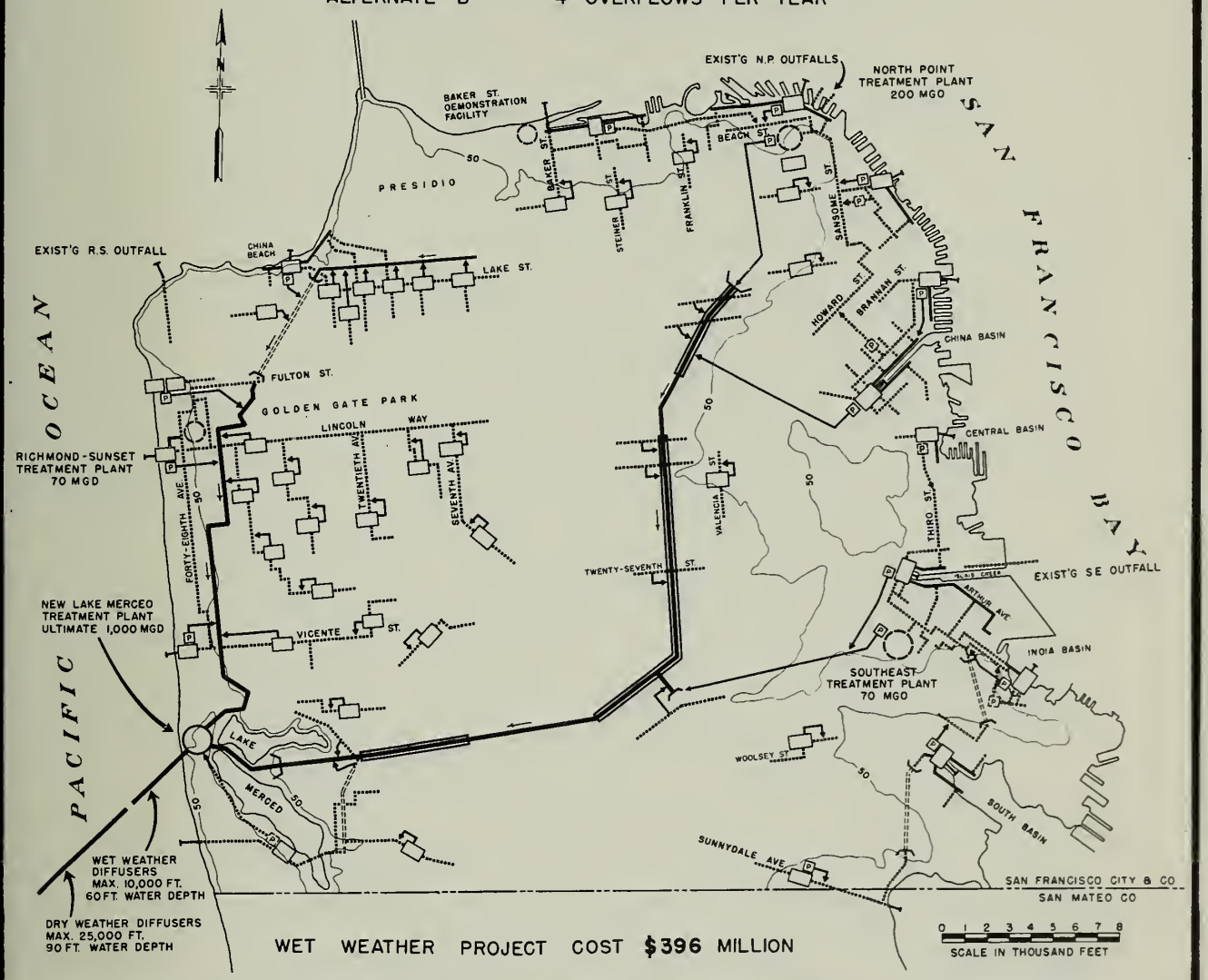
- RETENTION BASIN
- P PUMP STATION
- TREATMENT PLANT
- TUNNEL
- TUNNEL WITH STORAGE SECTION
- FORCE MAIN
- SEWER
- OVERFLOW SITE
- —50— 50 FT. CONTOUR LINE

AUGUST 24, 1971

PLATE VI-2

MASTER PLAN FOR WET WEATHER CONTROL

ALTERNATE B 4 OVERFLOWS PER YEAR



WET WEATHER PROJECT COST **$396** MILLION

	NUMBER OF OVERFLOW LOCATIONS	AVERAGE NUMBER OF OVERFLOWS PER YEAR	OURATION IN HOURS	TOTAL HOURS PER YEAR	VOLUME OF * UNTREATED OVERFLOW DISCHARGE (BILLIONS OF GALLONS)			VOLUME OF * TREATED DISCHARGE (BILLIONS OF GALLONS)			DAYS RECEIVING WATERS EXCEEDS BACTERIAL STANDARDS (PER YEAR)
					OCEAN	BAY	TOTAL	OCEAN	BAY	TOTAL	
EXISTING	43	82	2.5	205	2.0	4.0	6.0	8.2	30.6	38.8	171 0
ALTERNATE B	15	4	2.0	8	0.12	0.24	036	44.4	NIL	44.4	200-400
% REDUCED		95%		96%	955%	95.5%	95.5%				76 5-88 5%

	SUSPENDED SOLIDS (MILLIONS OF POUNDS/YEAR) @	COD (MILLIONS OF POUNDS/YEAR) @	GREASE (MILLIONS OF POUNDS/YEAR) @	FLOATABLES (MILLIONS OF POUNDS/YEAR) @	NITROGEN (MILLIONS OF POUNDS/YEAR) @	PHOSPHATE (MILLIONS OF POUNDS/YEAR) @
EXISTING	41.7	125.6	10.8	0.47	10.4	4.75
ALTERNATE B	13.2	80.9	3.3	0.32	9.7	1.39
% REDUCED	68.5%	35.5%	68.5%	32.0%	7.0%	70 5%

* GOLDEN GATE BRIDGE - DIVIDING BOUNDARY

@ CHEMICAL SEDIMENTATION

LEGEND

DASHED LINES DENOTE EXIST'G FACILITIES
SOLID LINES DENOTE NEW FACILITIES

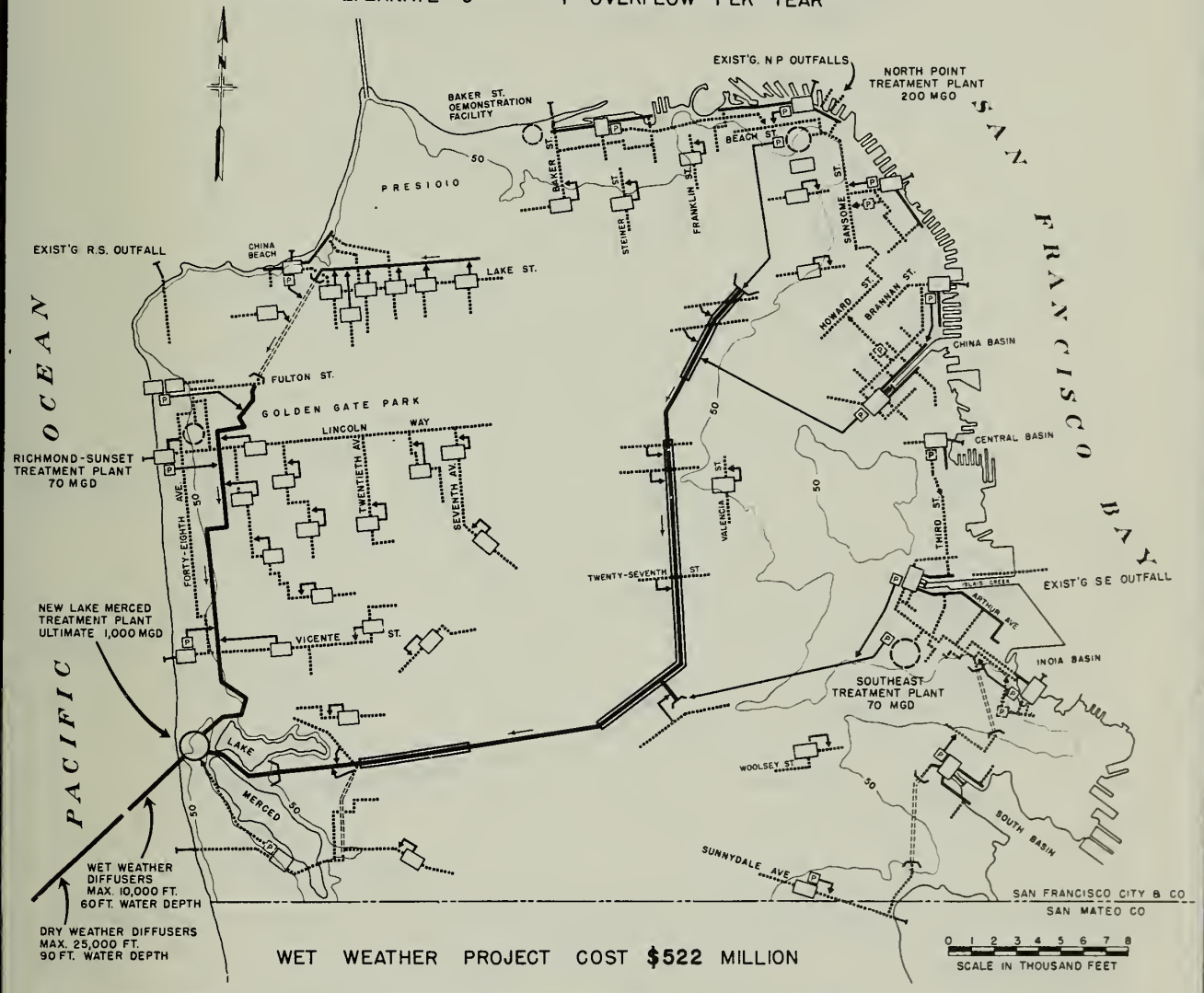
- RETENTION BASIN
- P PUMP STATION
- TREATMENT PLANT
- TUNNEL
- TUNNEL WITH STORAGE SECTION
- FORCE MAIN
- SEWER
- OVERFLOW SITE
- —50— 50 FT. CONTOUR LINE

AUGUST 24, 1971

PLATE VI-3

MASTER PLAN FOR WET WEATHER CONTROL

ALTERNATE C 1 OVERFLOW PER YEAR



WET WEATHER PROJECT COST $522 MILLION

	NUMBER OF OVERFLOW LOCATIONS	AVERAGE NUMBER OF OVERFLOWS PER YEAR	DURATION IN HOURS	TOTAL HOURS PER YEAR	VOLUME OF UNTREATED OVERFLOW DISCHARGE (BILLIONS OF GALLONS) †			VOLUME OF TREATED DISCHARGE (BILLIONS OF GALLONS) †			DAYS RECEIVING WATERS EXCEEDS BACTERIAL STANDARDS (PER YEAR)
					OCEAN	BAY	TOTAL	OCEAN	BAY	TOTAL	
EXISTING	43	82	2.5	205.0	2.0	4.0	6.0	8.2	30.6	38.8	171.0
ALTERNATE C	15	1	3.0	3.0	0.03	0.06	0.09	44.7	NIL	44.7	5.0-10.0
% REDUCED		99%		98.5%							97.0-94.0%

	SUSPENDED SOLIDS @ (MILLIONS OF POUNDS/YEAR)	COD @ (MILLIONS OF POUNDS/YEAR)	GREASE @ (MILLIONS OF POUNDS/YEAR)	FLOATABLES @ (MILLIONS OF POUNDS/YEAR)	NITROGEN @ (MILLIONS OF POUNDS/YEAR)	PHOSPHATE @ (MILLIONS OF POUNDS/YEAR)
EXISTING	41.7	125.6	10.8	0.47	10.4	4.75
ALTERNATE C	12.4	80.6	3.3	0.31	9.7	1.39
% REDUCED	70.5%	36.0%	69.0%	33.5%	7.0%	71.0%

† GOLDEN GATE BRIDGE-DIVIDING BOUNDARY

@ CHEMICAL SEDIMENTATION

LEGEND

DASHED LINES DENOTE EXIST'G. FACILITIES
SOLID LINES DENOTE NEW FACILITIES

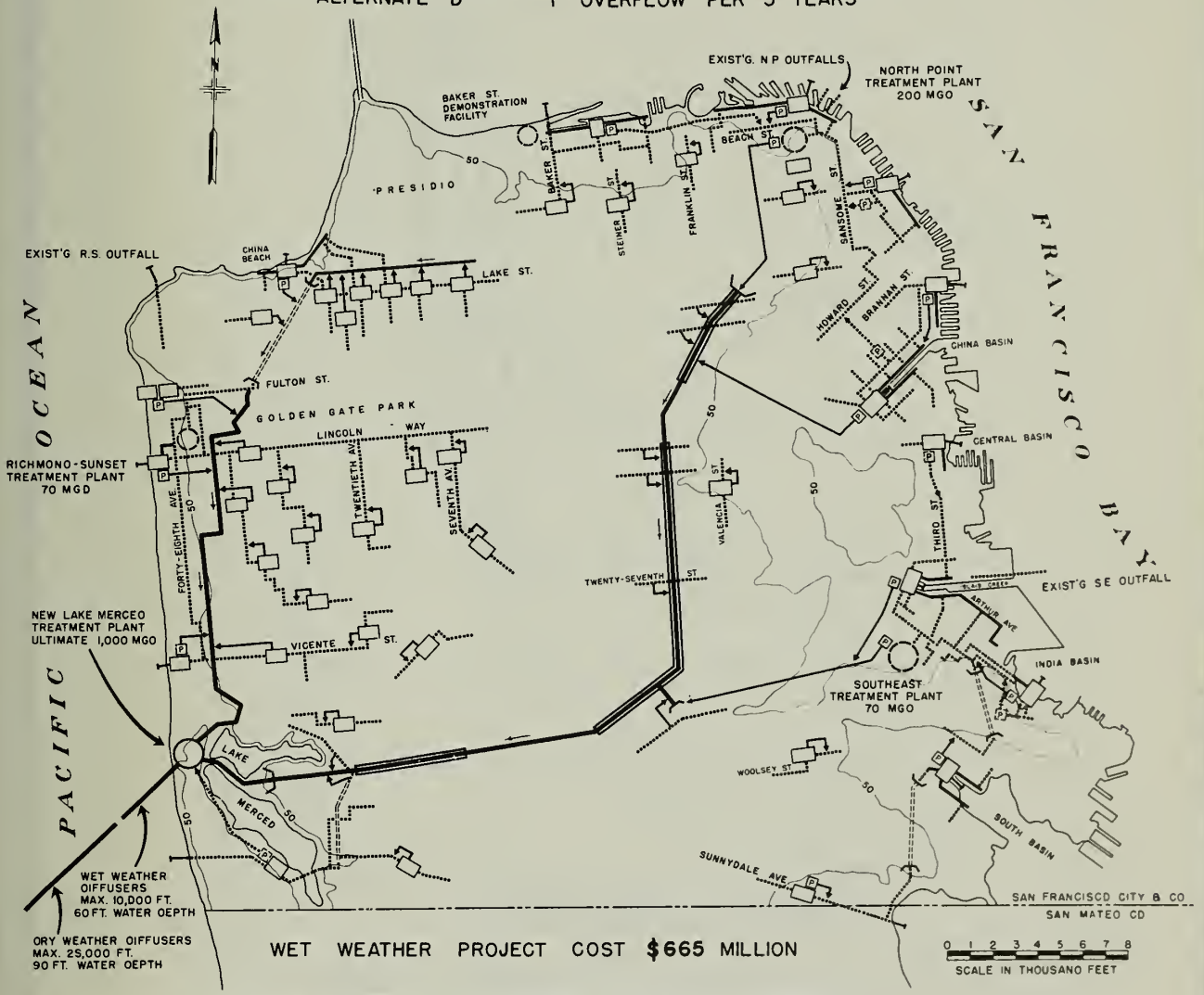
- RETENTION BASIN
- P PUMP STATION
- TREATMENT PLANT
- TUNNEL
- TUNNEL WITH STORAGE SECTION
- FORCE MAIN
- SEWER
- OVERFLOW SITE
- —50— 50 FT CONTOUR LINE

AUGUST 24, 1971

PLATE VI-4

MASTER PLAN FOR WET WEATHER CONTROL

ALTERNATE D 1 OVERFLOW PER 5 YEARS



WET WEATHER PROJECT COST $665 MILLION

SCALE IN THOUSAND FEET

	NUMBER OF OVERFLOW LOCATIONS	AVERAGE NUMBER OF OVERFLOWS PER YEAR	DURATION IN HOURS	TOTAL HOURS PER YEAR	VOLUME OF UNTREATED OVERFLOW DISCHARGE (BILLIONS OF GALLONS) *			VOLUME OF TREATED DISCHARGE (BILLIONS OF GALLONS) *			DAYS RECEIVING WATERS EXCEEDS BACTERIAL STANDARDS (PER YEAR)
					OCEAN	BAY	TOTAL	OCEAN	BAY	TOTAL	
EXISTING	43	82.0	2.5	205.0	2.0	4.0	6.0	8.2	30.6	38.8	171
ALTERNATE D	15	0.2 *	4.0	0.8 *	0.008	0.016	0.024	44.8	NIL	44.8	*
% REDUCED		100%		99.5%							

	SUSPENDED SOLIDS @ (MILLIONS OF POUNDS/YEAR)	COD @ (MILLIONS OF POUNDS/YEAR)	GREASE @ (MILLIONS OF POUNDS/YEAR)	FLOATABLES @ (MILLIONS OF POUNDS/YEAR)	NITROGEN @ (MILLIONS OF POUNDS/YEAR)	PHOSPHATE @ (MILLIONS OF POUNDS/YEAR)
EXISTING	41.7	125.6	10.8	0.47	10.4	4.75
ALTERNATE D	12.1 *	80.5	3.3	0.31	9.7	1.38
% REDUCED	71.0%	36.0%	69.5%	34.0%	7.0%	71.0%

* EQUIVALENT ANNUAL AVERAGE FOR 1 PER 5 YEARS OCCURRENCE (UNTREATED FRACTION)

* GOLDEN GATE BRIDGE - DIVIDING BOUNDARY

@ CHEMICAL SEDIMENTATION

LEGEND

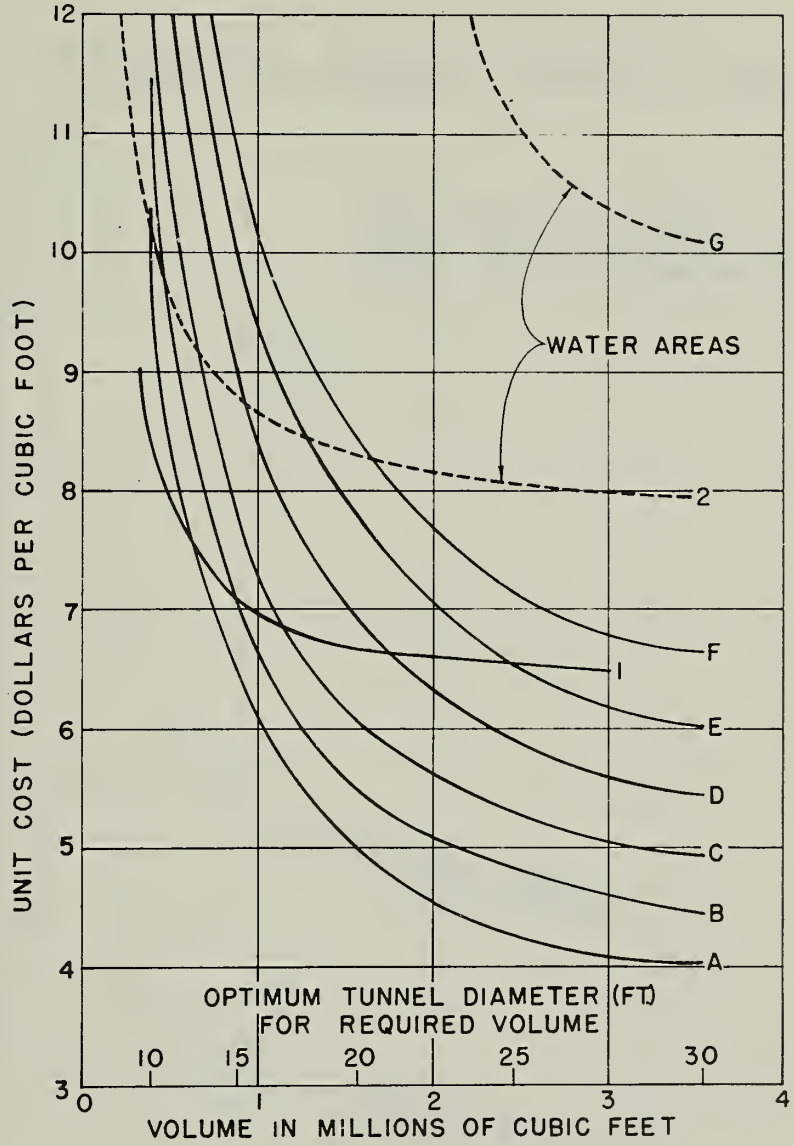
DASHED LINES DENOTE EXIST'G FACILITIES
SOLID LINES DENOTE NEW FACILITIES

- RETENTION BASIN
- P PUMP STATION
- TREATMENT PLANT
- TUNNEL
- TUNNEL WITH STORAGE SECTION
- FORCE MAIN
- SEWER
- OVERFLOW SITE
- —50— 50 FT. CONTOUR LINE

AUGUST 24, 1971

PLATE VI-5

COST COMPARISON PER UNIT VOLUME RETENTION BASINS AND TUNNELS

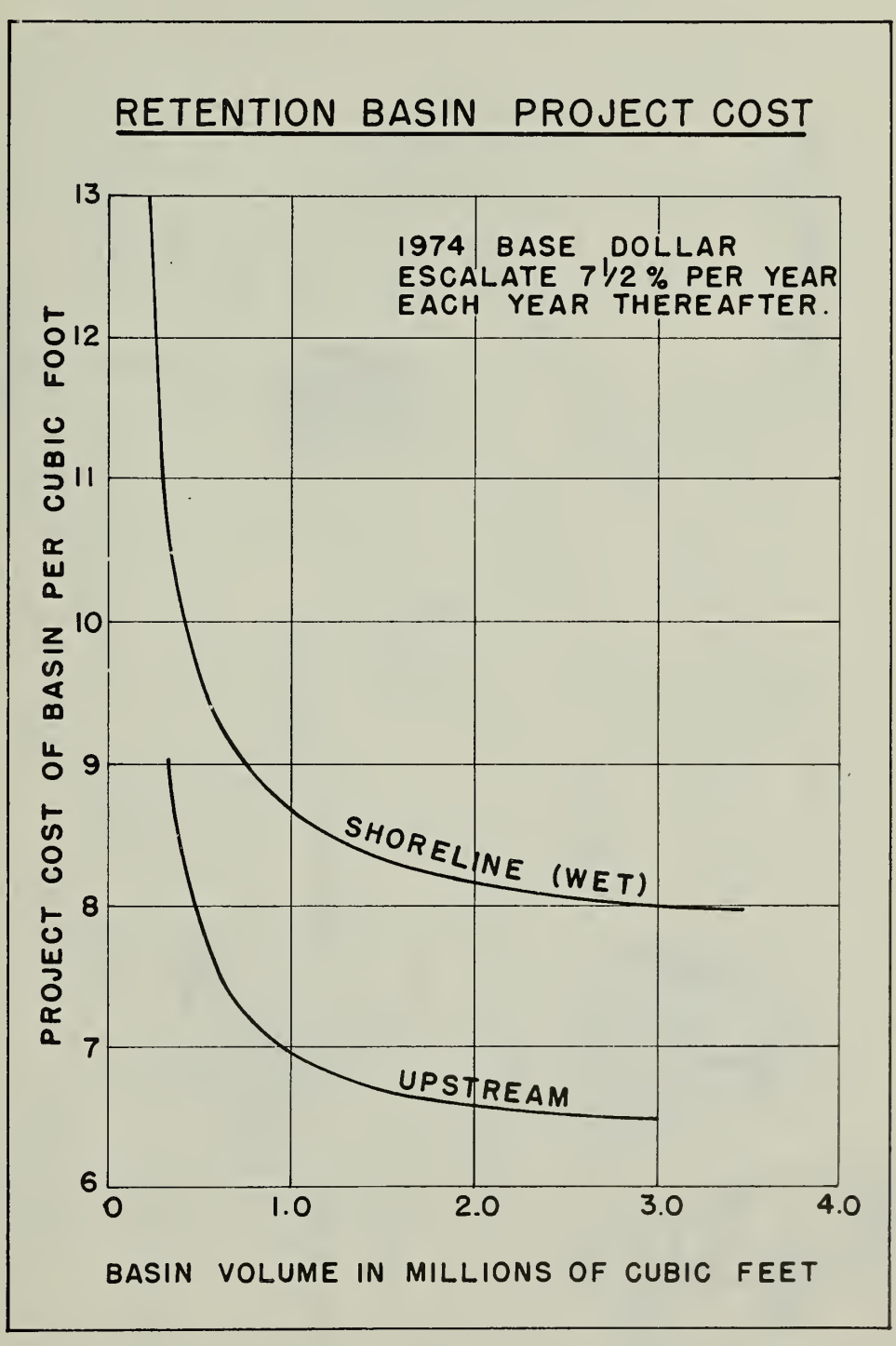


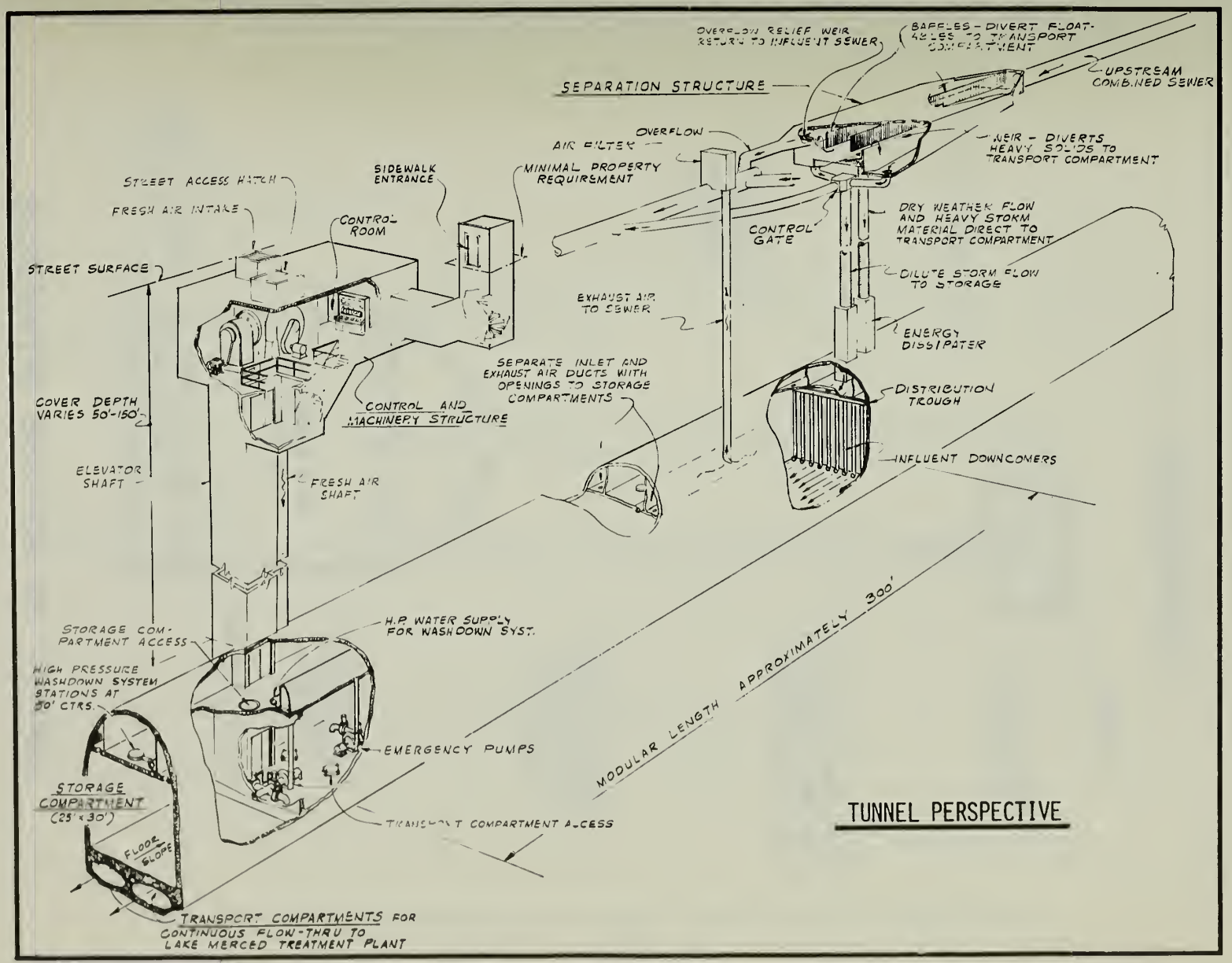
1. UPSTREAM BASIN
2. SHORELINE BASIN (WATER AREAS)

TUNNEL COST BASED ON 5,000 FOOT LENGTH

A. SANDSTONE
B. SAND, COMMON & SANDSTONE
C. CHERT, BASALT, SERPENTIZED PERIDOTITE
D. SANDSTONE , FAULT ZONE
E. SAND
F. CHERT, BASALT, SERPENTIZED PERIDOTITE, FAULT ZONE
G. FILL AREAS UNDER AIR PRESSURE (WATER AREAS)

PLATE VI-6

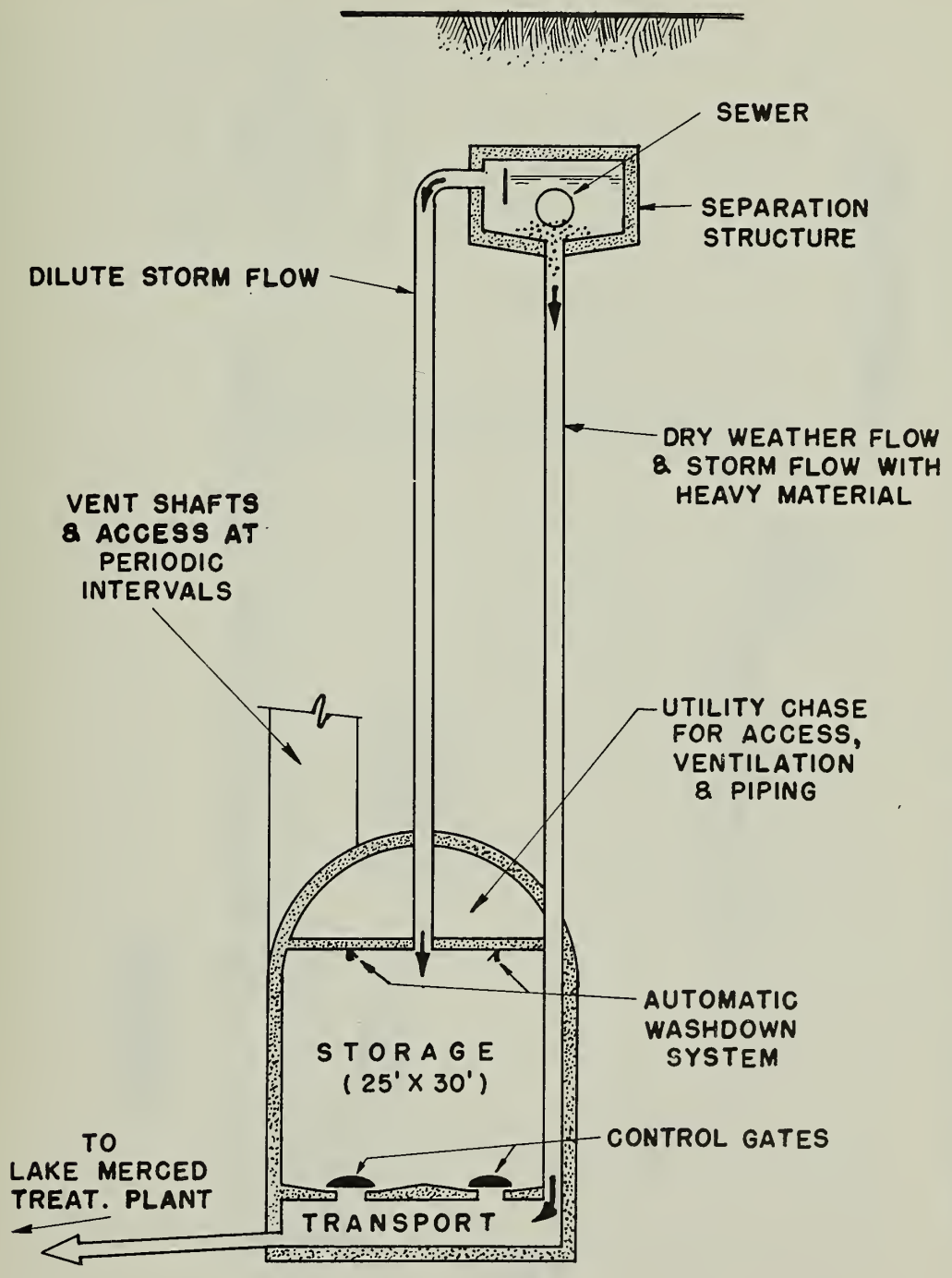

RETENTION BASIN PROJECT COST
1974 BASE DOLLAR
ESCALATE 7½% PER YEAR
EACH YEAR THEREAFTER.
SHORELINE (WET)
UPSTREAM
PROJECT COST OF BASIN PER CUBIC FOOT
13
12
11
10
9
8
7
6
0
1.0
2.0
3.0
4.0
BASIN VOLUME IN MILLIONS OF CUBIC FEET


OVERFLOW RELIEF WEIR RETURN TO INFLUENT SEWER
BAFFLES - DIVERT FLOATABLES TO TRANSPORT COMPARTMENT
SEPARATION STRUCTURE
UPSTREAM COMBINED SEWER
OVERFLOW
AIR FILTER
WEIR - DIVERTS HEAVY SOLIDS TO TRANSPORT COMPARTMENT
STREET ACCESS HATCH
SIDEWALK ENTRANCE
MINIMAL PROPERTY REQUIREMENT
FRESH AIR INTAKE
CONTROL ROOM
CONTROL GATE
DRY WEATHER FLOW AND HEAVY STORM MATERIAL DIRECT TO TRANSPORT COMPARTMENT
STREET SURFACE
DILUTE STORM FLOW TO STORAGE
EXHAUST AIR TO SEWER
ENERGY DISSIPATER
SEPARATE INLET AND EXHAUST AIR DUCTS WITH OPENINGS TO STORAGE COMPARTMENTS
DISTRIBUTION TROUGH
COVER DEPTH VARIES 50'-150'
CONTROL AND MACHINERY STRUCTURE
ELEVATOR SHAFT
FRESH AIR SHAFT
INFLUENT DOWNCOMERS
STORAGE COMPARTMENT ACCESS
H.P. WATER SUPPLY FOR WASHDOWN SYST.
HIGH PRESSURE WASHDOWN SYSTEM STATIONS AT 50' CTRS.
EMERGENCY PUMPS
MODULAR LENGTH APPROXIMATELY 300'
STORAGE COMPARTMENT (25' x 30')
FLOOR SLOPE
TRANSPORT COMPARTMENT ACCESS
TRANSPORT COMPARTMENTS FOR CONTINUOUS FLOW-THRU TO LAKE MERCED TREATMENT PLANT

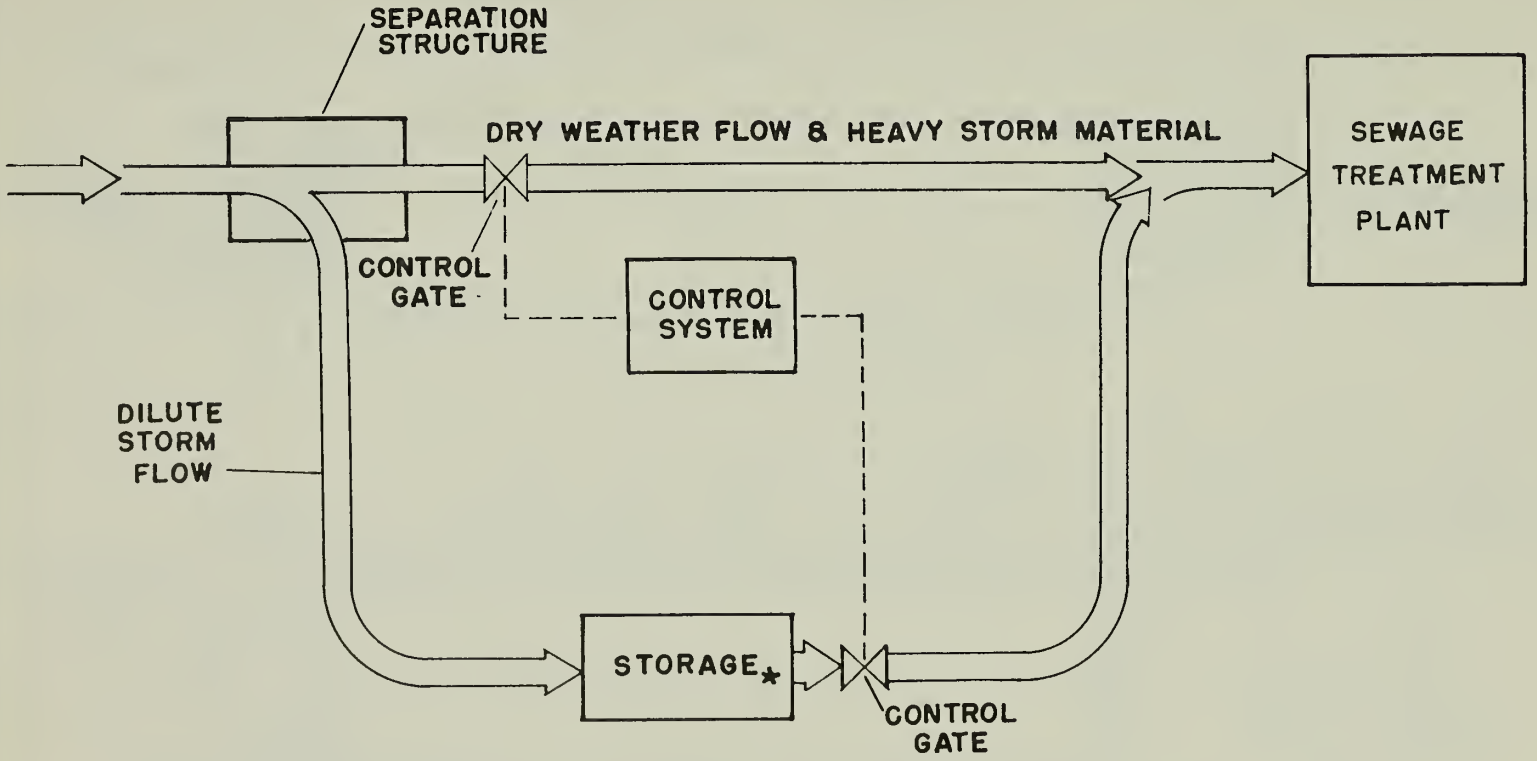
TUNNEL PERSPECTIVE

PLATE VI-7

PLATE VI-8


SEWER
SEPARATION STRUCTURE
DILUTE STORM FLOW
DRY WEATHER FLOW & STORM FLOW WITH HEAVY MATERIAL
VENT SHAFTS & ACCESS AT PERIODIC INTERVALS
UTILITY CHASE FOR ACCESS, VENTILATION & PIPING
AUTOMATIC WASHDOWN SYSTEM
STORAGE (25' X 30')
CONTROL GATES
TO LAKE MERCED TREAT. PLANT
TRANSPORT

SCHEMATIC SECTION OF TUNNEL

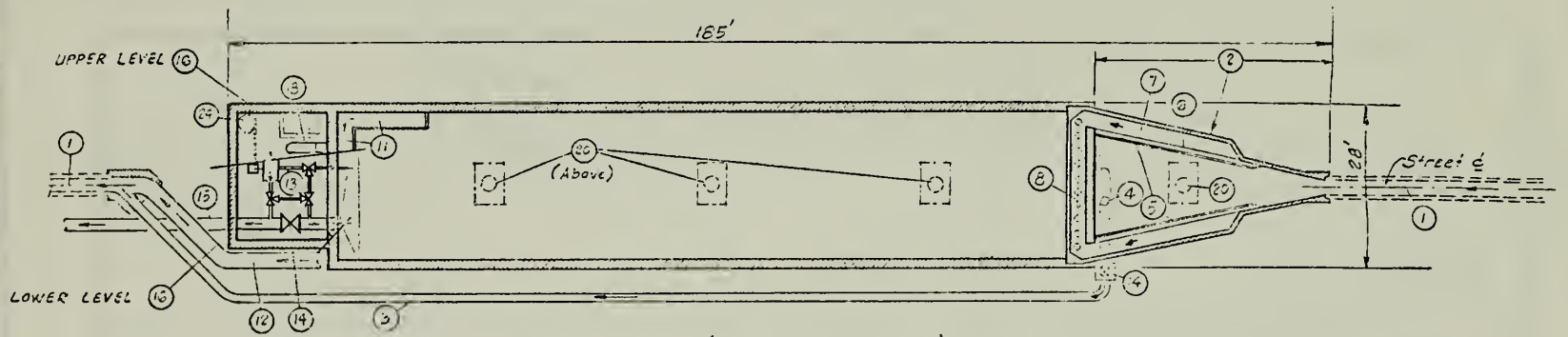


SCHEMATIC DIAGRAM OF WET WEATHER CONTROL

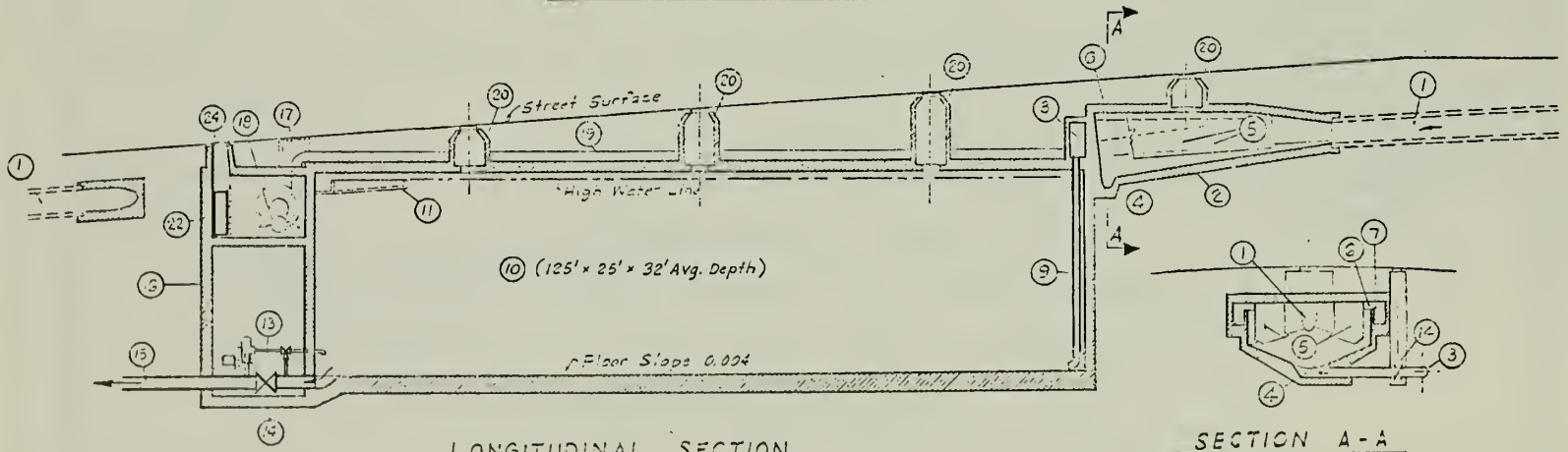
PLATE VI-9

KEY

1. EXISTING COMBINED SEWER (2'-6" x 3'-9")
2. MATERIAL SEPARATION STRUCTURE
3. DRY WEATHER SANITARY & OPTIONAL STORM FLOW BYPASS
4. DRAIN TO BYPASS - Shunts heavy & floatable fractions past storage.
5. BAFFLES - Entraps floatables until after storm.
6. WEIR - Retains heavy material, passes dilute storm flow to storage.
7. INFLUENT TO STORAGE
8. DISTRIBUTION CHANNEL
9. DOWNCOMERS
10. STORAGE COMPARTMENT (100,000 cu.ft.)
11. OVERFLOW TROUGH
12. OVERFLOW DISCHARGE CONDUIT
13. EMERGENCY DEWATERING PUMP SYSTEM
14. CONTROL GATE
15. GRAVITY DISCHARGE - Reconnects with combined sewer downstream.
16. UNDERGROUND SERVICE AREA
17. AIR INTAKE
18. FAN
19. FORCED AIR CONDUIT
20. H.P WASHDOWN SYSTEM VAULT
22. LOCAL AUTOMATIC & REMOTE CONTROL STATION - Controls valves, pumps, etc. Receives signals from central control station
24. STATION ACCESS MANHOLE



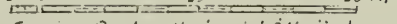
PLAN (ROOF REMOVED)



LONGITUDINAL SECTION

SECTION A-A

INLAND BASIN



Graphic Scale : Horizontal & Vertical

PLATE VI-10

DEFINITIONS AND EFFICIENCIES OF TREATMENT LEVELS

Levels of Treatment	Survival in Undiluted Waste Stream	BOD Removal (%)	Nitrogen Removal (%)	Phosphate Removal (%)	Suspended Solids Removal (%)	Grease in Effluent (mg/l)	May Be Accomplished By
I. First Level Treatment (1)	25	40	15	50	75	25	Chemical Treatment using a low Ferric Chloride dosage.
II. Second Level Treatment (2)	40	70	20	85	88	15	Chemical Treatment using a high Lime dosage.
III. Third Level Treatment (3) & (4)	90	94	85	93	98	10	Chemical Treatment utilizing a high Lime dosage treatment **followed by Reclamation Treatment**

Notes:

1) Equivalent removal efficiency described as Advanced Primary Treatment in Bay-Delta Report
2) Equivalent removal efficiency described as Intermediate Treatment in Bay-Delta Report
3) Equivalent removal efficiency described as Tertiary Treatment in Bay-Delta Report
4) The proposed reclamation treatment for Dry Weather flow would consist of the following additional unit processes: Super Chlorination, Dual Media Filtration and Carbon Adsorption.

PLATE VI-11

FIRST COST COMPARISON OF EXPANDING 3 EXISTING PLANTS vs. 1 NEW PLANT

	TYPE OF TREATMENT	TREATMENT RATE - MGD				COST MILLIONS		
		R-S	SE	NP	LM	Dry Wea.	Wet Wea.	Total
A. EQUIVALENT LEVELS - ALL PLANTS	I. First Level Treatment							
	a)	70	70	200	660	$ 42	$105	$147
	b)	x	70	200	730	41	103	144
	c)	x	x	200	800	40	101	141
	d)	x	x	x	1000	42	107	149
	II. Second Level Treatment							
	a)	70	70	200	660	66	104	171
	b)	x	70	200	730	69	103	172
	c)	x	x	200	800	73	101	174
	d)	x	x	x	1000	83	107	190
	III. Third Level Treatment							
	a)	70	70	200	660	168	105	273
	b)	x	70	200	730	161	103	264
	c)	x	x	200	800	144	101	245
	d)	x	x	x	1000	130	107	237
B. VARIABLE LEVELS	I. Second Level Treatment at NP, and Ocean Discharge; Third Level at SE							
	a)	70	70	200	660	93	105	198
	b)	x	70	200	730	95	103	199
	c)	x	x	200	800	73	101	174
	d)	x	x	x	1000	83	107	190
	II. Second Level Ocean Discharge; Third Level NP & SE							
	a)	70	70	200	660	147	105	252
	b)	x	70	200	730	150	103	253
	c)	x	x	200	800	127	101	228
	d)	x	x	x	1000	83	107	190

x - Abandoned Wea. - Weather

PLATE VI-13

EFFECT TO TOTAL COST OF IMMEDIATE COMPLIANCE WITH EPA 85% REMOVAL REGULATION

This table presents the costs of bringing the existing Richmond-Sunset, Southeast and North Point treatment plants to the First Level of treatment and the unrecoverable costs that would result in replacing these plants with a new plant at Lake Merced with an Ocean outfall.

	OCEAN DISPOSAL COSTS (MILLIONS OF DOLLARS)			
	RSWPCP AND SEWPCP		NPWPCP, RSWPCP, & SEWPCP	
	FIRST LEVEL	SECOND LEVEL	FIRST LEVEL	SECOND LEVEL
I. TREATMENT PLANTS				
A. N.P.W.P.C.P.				
a) Plant Improvements	$ 11.3	$ 15.8	$ 11.3	$ 15.8
b) Solids Handling at SEWPCP	8.5	16.5	8.5	16.5
B. S.E.W.P.C.P.				
a) Plant Improvements	7.1	8.0	7.1	8.0
b) Solids Handing	6.1	11.1	6.1	11.1
C. R.S.W.P.C.P.				
a) Plant Improvements	5.6	6.6	5.6	6.6
b) Solids Handling	2.2	7.0	2.2	7.0
II. PUMP STATIONS & FORCE MAINS TO OCEAN	10.0	10.0	31.9	31.9
III. OUTFALL (NORTH POINT)	7.5	7.5	-	-
TOTAL	$ 58.3	$ 82.5	$ 72.2	$ 96.9
Recoverable Portion of Dollar Expenditure with Development of Lake Merced Treatment Plant as a Replacement Plant:				
a) Solids Handling at SEWPCP	$ 14.6	$ 27.6	$ 14.6	$ 27.6
b) Outfall	7.5	7.5	-	-
c) Pumps and Force Mains(1)	5.4	5.4	16.4	16.4
TOTAL	$ 27.5	$ 40.5	$ 31.0	$ 44.0
Unrecoverable Portion of Dollar Expenditure	$ 30.8	$ 42.0	$ 41.7	$ 52.9

(1) A recoverable portion of $11.0 million and $5.4 million was allocated for the North Point and Southeast pump stations and force mains, respectively. It is believed that this portion of the force mains and pump stations could be utilized to connect to a proposed crosstown tunnel.

PLATE VI-14

PROGRAM COSTS (1974 MILLION DOLLARS) FOR COMBINED DRY - WET WEATHER PROGRAMS

	WET WEATHER ALTERNATIVES			
	A	B	C	D
WET WEATHER COSTS	$ 333	$ 396	$ 522	$ 665

COMBINED DRY-WET WEATHER COSTS

DRY WEATHER PROGRAM	LEVEL OF TREATMENT	WET WEATHER ALTERNATIVES			
		A	B	C	D
SCHEME I (Most economical)*	1	$375	$438	$564	$707
	2	416	479	605	748
	3	463	526	652	795
SCHEME II (S.E. effluent to ocean)	1	406	469	595	738
	2	458	521	647	790
	3	505	568	694	837
SCHEME III (S.E. & N.P. effluent to ocean)	1	417	480	606	749
	2	469	532	658	801
	3	516	579	705	848

* "Most economical" means - Optimized staging of facilities to meet wet weather requirements with least duplication of dry weather costs.

PLATE VI-15

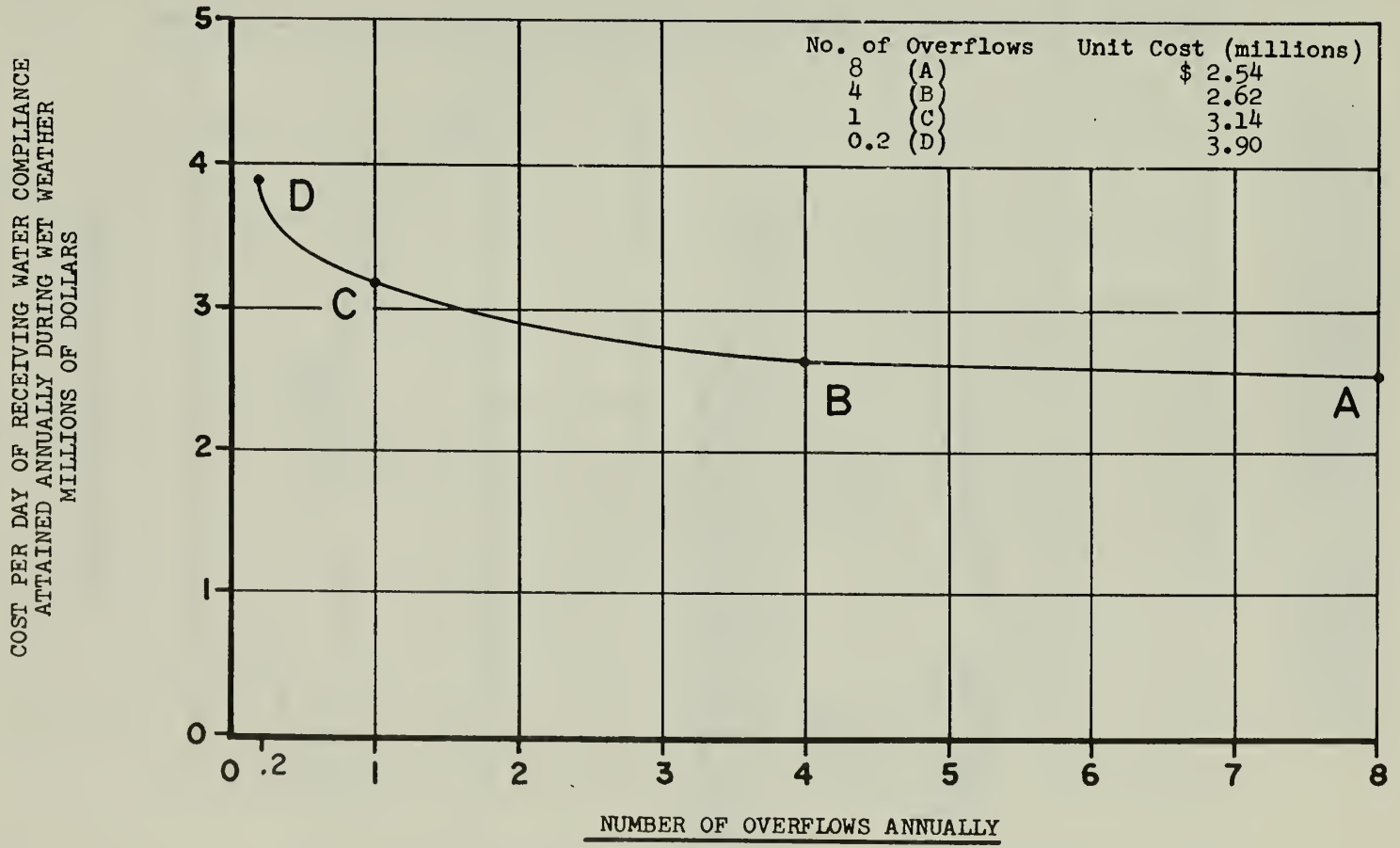
COMPARISON OF WET WEATHER COST VS. ACCOMPLISHMENTS

	EXIST. COND.	ALTERNATE A	B	C	D
Cost (Wet Weather) - $ Millions		$333	$396	$522	$665
Per Annun - Average					
Number of overflow occurrences	82	8	4	1	0.2[a]
% Reduction[b]		90	95	99	99+
Duration in hours	2.5	2	2	3	4
% Reduction		-	-	-	-
Total Hours	205	16	8	3	1
% Reduction		92	96	99	99+
Vol. of untreated overflow discharge (billions of gallons)	6	.8	.4	.1	.02
% Reduction		88	96	98	99+
Vol. of treated discharge (billions of gallons)	38.8	44.1	44.4	44.7	45
Days receiving H_2O exceeds bact. standards	171	40	20	5	1
% Reduction		77	88	94	99+
Suspended solids (million lbs.)	42	14.3	13.2	12.4	12.1
% Reduction		66	68	70	71
COD (millions lbs.)	126	81.2	80.9	80.6	80.5
% Reduction		35	36	36	36
Grease (millions lbs.)	10.8	3.5	3.4	3.3	3.3
% Reduction		68	69	69	69
Flotables (millions lbs.)	0.5	0.3	0.3	0.3	0.3
% Reduction		30	32	33	34
Nitrogen (millions lbs.)	10.4	9.7	9.7	9.7	9.7
% Reduction		7	7	7	7
Phosphate (millions lbs.)	5	1.4	1.4	1.4	1.4
% Reduction		71	71	71	71

[a] 0.2 equivalent to "once per 5 years" frequency.

[b] from "Existing Condition".

COST PER DAY OF WET WEATHER RECEIVING
WATER COMPLIANCE ANNUALLY BASED UPON
WET WEATHER FIRST COSTS IN MILLIONS OF DOLLARS

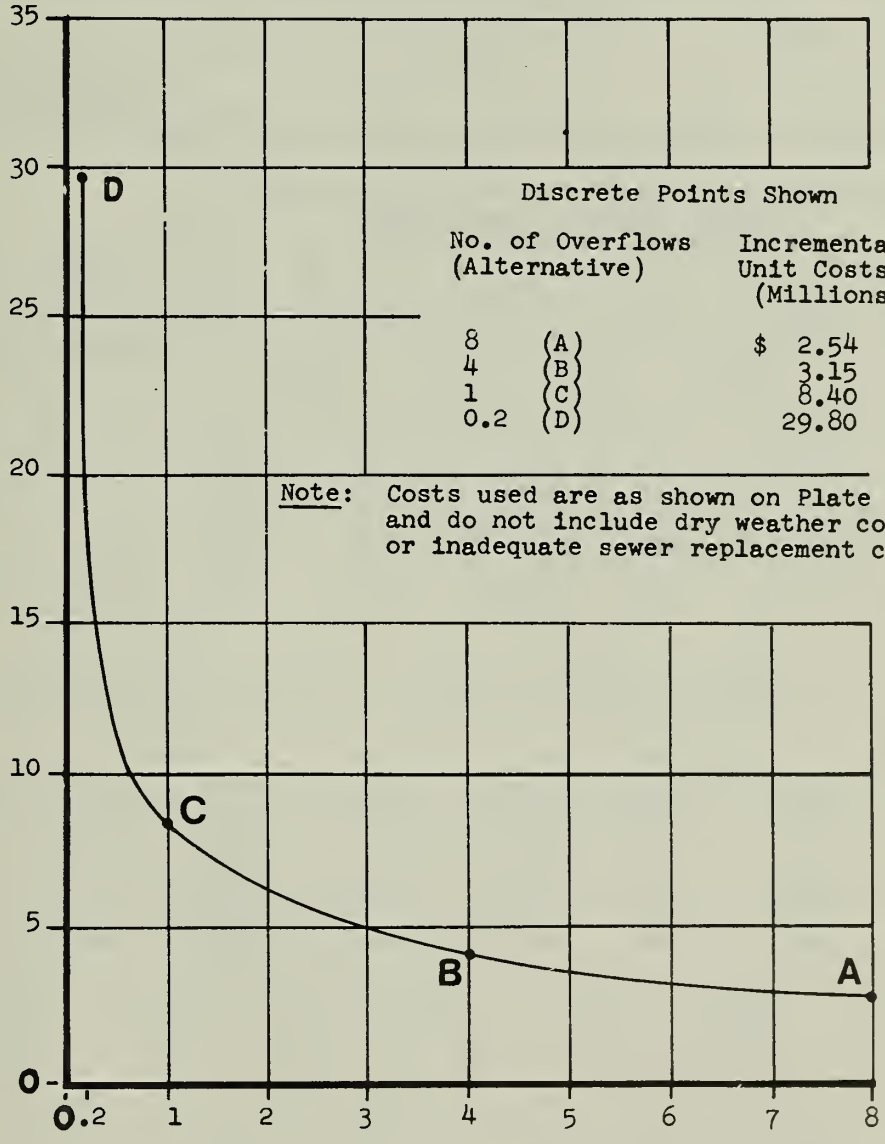


Note: Costs used are as shown on Plate VI-15 and do not include dry weather costs or inadequate sewer replacement costs.

PLATE VI-16

PLATE VI-17

Cost Per Day of Wet Weather Receiving Water Compliance Annually Between Alternatives Based Upon Incremental First Costs and Days of Compliance Attained



Discrete Points Shown

No. of Overflows (Alternative)		Incremental Unit Costs (Millions)
8	(A)	$ 2.54
4	(B)	3.15
1	(C)	8.40
0.2	(D)	29.80

Note: Costs used are as shown on Plate VI-15 and do not include dry weather costs or inadequate sewer replacement costs.

PLATE VI-18

COST AND REMOVAL EFFICIENCIES
FOR VARIOUS TREATMENT LEVELS & STORAGE ALTERNATIVES

	COD	TSS	TN	TP	HEM	FLOAT-ABLES
TOTAL RAW EMISSIONS (Millions of pounds)	201.1	96.1	12.073	9.212	22.21	1.241

TREATMENT LEVEL AND STORAGE ALTERNATIVES	COST (millions of dollars)	REMOVAL EFFICIENCIES (PERCENT) COD	TSS	TN	TP	HEM	FLOAT-ABLES
LEVEL 1							
Alternate A	$ 382	39.7	73.0	14.9	49.9	54.7	73.7
Alternate B	450	39.9	73.9	15.0	49.9	54.8	74.3
Alternate C	574	40.0	74.7	15.0	50.0	55.0	74.8
Alternate D	719	40.0	75.0	15.0	50.0	55.0	75.0
LEVEL 2							
Alternate A	423	58.9	82.9	19.7	84.6	83.6	73.7
Alternate B	491	59.0	83.8	19.8	84.7	83.7	74.3
Alternate C	615	59.1	84.6	19.8	84.7	83.9	74.8
Alternate D	760	59.1	84.7	19.8	84.7	83.9	75.0
LEVEL 3							
Alternate A	470	91.5	91.3	82.5	94.5	88.4	86.7
Alternate B	538	91.6	92.1	82.5	94.6	88.5	87.3
Alternate C	662	91.7	92.9	82.6	94.6	88.7	87.8
Alternate D	807	91.7	92.9	82.6	94.6	88.7	87.9

PLATE VI-19

PUMPING REQUIRED FOR TREATMENT UNDER EXISTING CONDITIONS AND PROPOSED LAKE MERCED PLANT

TREATMENT PLANT	EXISTING CONDITIONS[1]		MASTER PLAN[2]	
	PUMPED[3] (Percent)	GRAVITY (Percent)	PUMPED (Percent)	GRAVITY (Percent)
N.P.W.P.C.P.	162	0	20.3	9.8
R.S.W.P.C.P.	72	34	6.8	26.0
S.E.W.P.C.P.	172	0	23.2	13.9
T O T A L	147	6	50.3	49.7

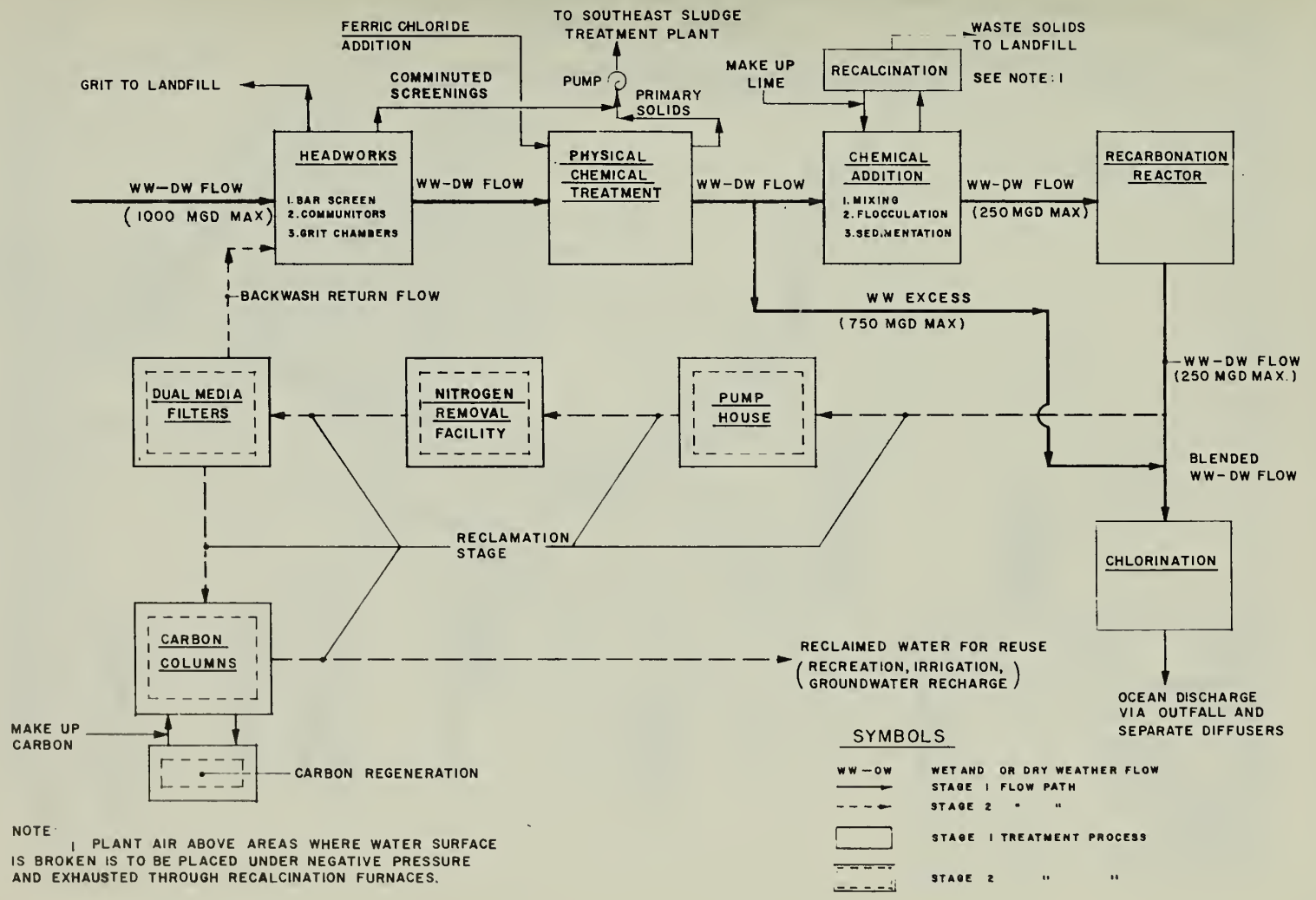
(1) Based on 1969-1970 fiscal year with a total flow of 37.4 billion gallons for treatment.

(2) Based on wet weather areas.

(3) The total flow pumped during 1969-1970 was 55.1 billion gallons, which means that some flow was pumped more than one time.

PROPOSED LAKE MERCED WATER POLLUTION CONTROL PLANT

CONCEPTUAL FLOW DIAGRAM

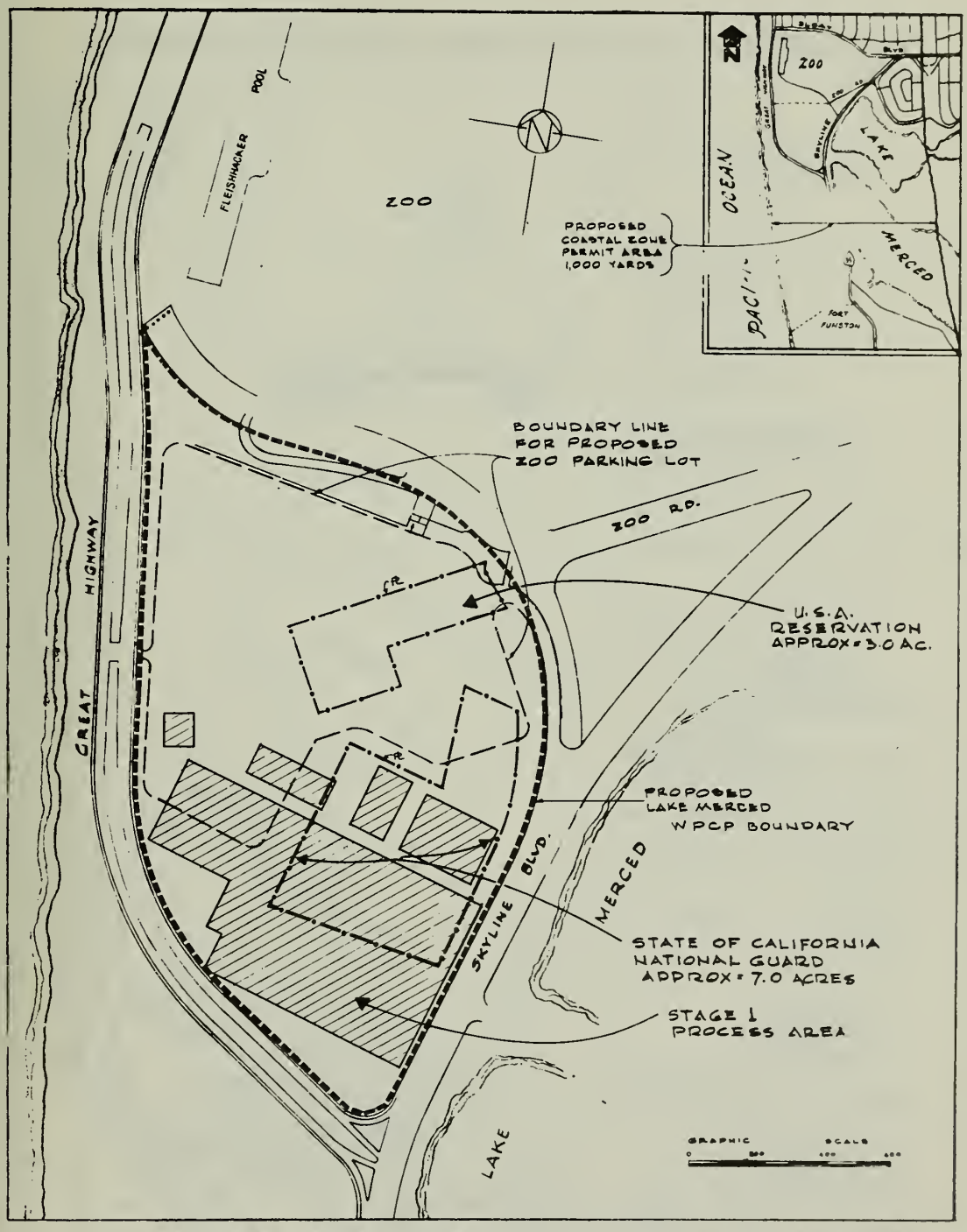


NOTE

1 PLANT AIR ABOVE AREAS WHERE WATER SURFACE IS BROKEN IS TO BE PLACED UNDER NEGATIVE PRESSURE AND EXHAUSTED THROUGH RECALCINATION FURNACES.

PLATE VI-20

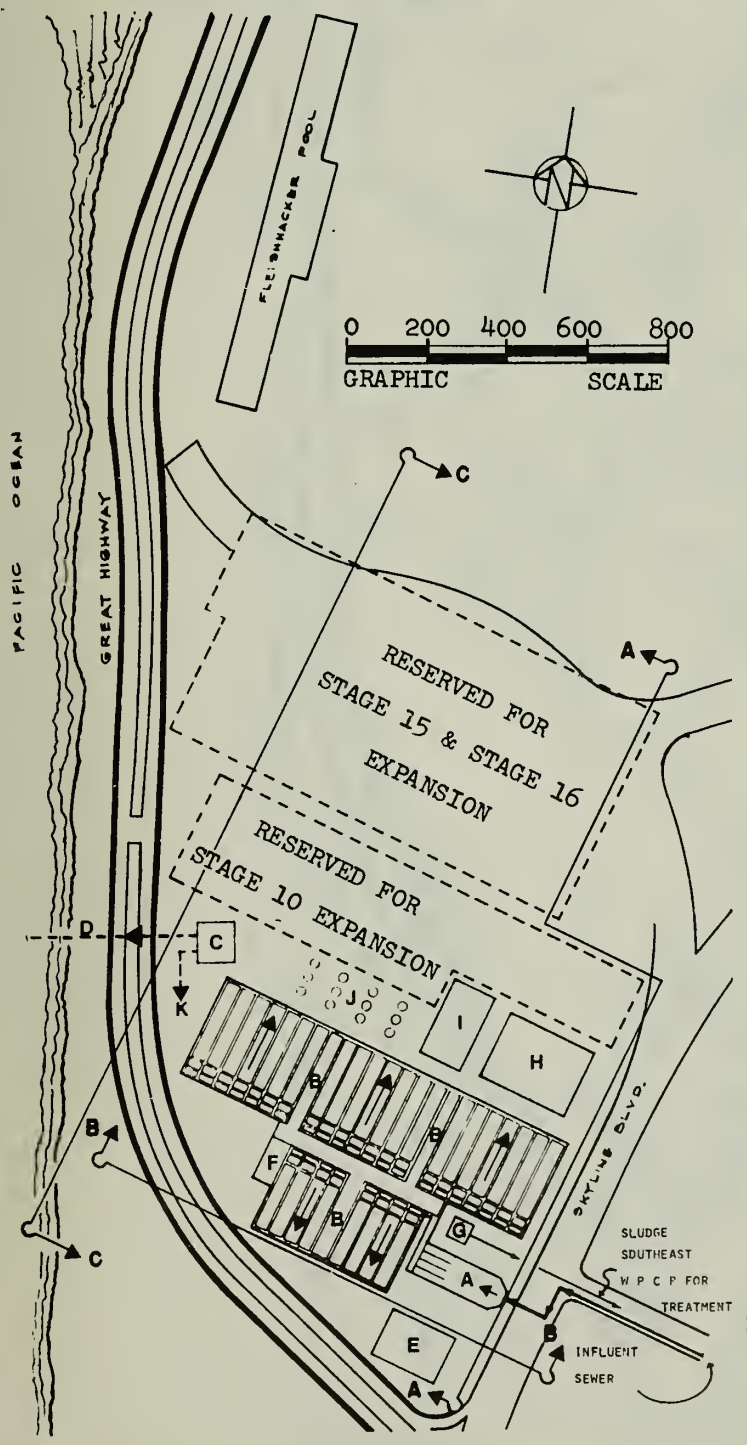
PLATE VI-21



PROPOSED LAKE MERCED WATER POLLUTION CONTROL PLANT SITE
(PROPOSED ZOO PARKING LOT AND EXISTING FEDERAL AND STATE PROPERTIES)

PLATE VI-22

PROPOSED LAKE MERCED WATER POLLUTION CONTROL PLANT



STAGE 5

TOTAL DRY AND WET WEATHER FLOW
325 MGD

CHEMICAL TREATMENT

1ST LEVEL 325 MGD
2ND LEVEL - DRY WEATHER ONLY - 27 MGD AVG DAY)

(A) HEADWORKS
BARS SCREENS AND
GRIT CHAMBERS

(B) PHYSICAL-CHEMICAL TREATMENT TANKS

(C) CHLORINATION FACILITY

(D) OCEAN OUTFALL AND DIFFUSER
LENGTH - WET WEATHER - 10,000 FT.
LENGTH - DRY WEATHER - 22,000 FT.

(E) CONTROL HOUSE

(F) DEMONSTRATION FACILITIES FOR WASTE WATER RECLAMATION

(G) SLUDGE PUMP HOUSE

STAGE 10

TOTAL DRY AND WET WEATHER FLOW
550 MGD
EXPANDED DRY AND WET WEATHER FACILITIES
AND ADDED RECLAMATION FACILITIES

CHEMICAL TREATMENT
1ST LEVEL 550 MGD
(2ND LEVEL - DRY WEATHER ONLY - 51 MGD AVG DAY)
(3RD LEVEL - DRY WEATHER ONLY - RECLAMATION 51 MGD AVG.DAY)

(C) RECLAMATION PUMPS ADDED AT CHLORINATION BUILDING

(H) RECLAMATION FACILITIES-RECARBONATION AND NITROGEN REMOVAL

(I) RECLAMATION FACILITY - DUAL MEDIA FILTERS

(J) RECLAMATION FACILITY - CARBON COLUMNS

STAGE 15

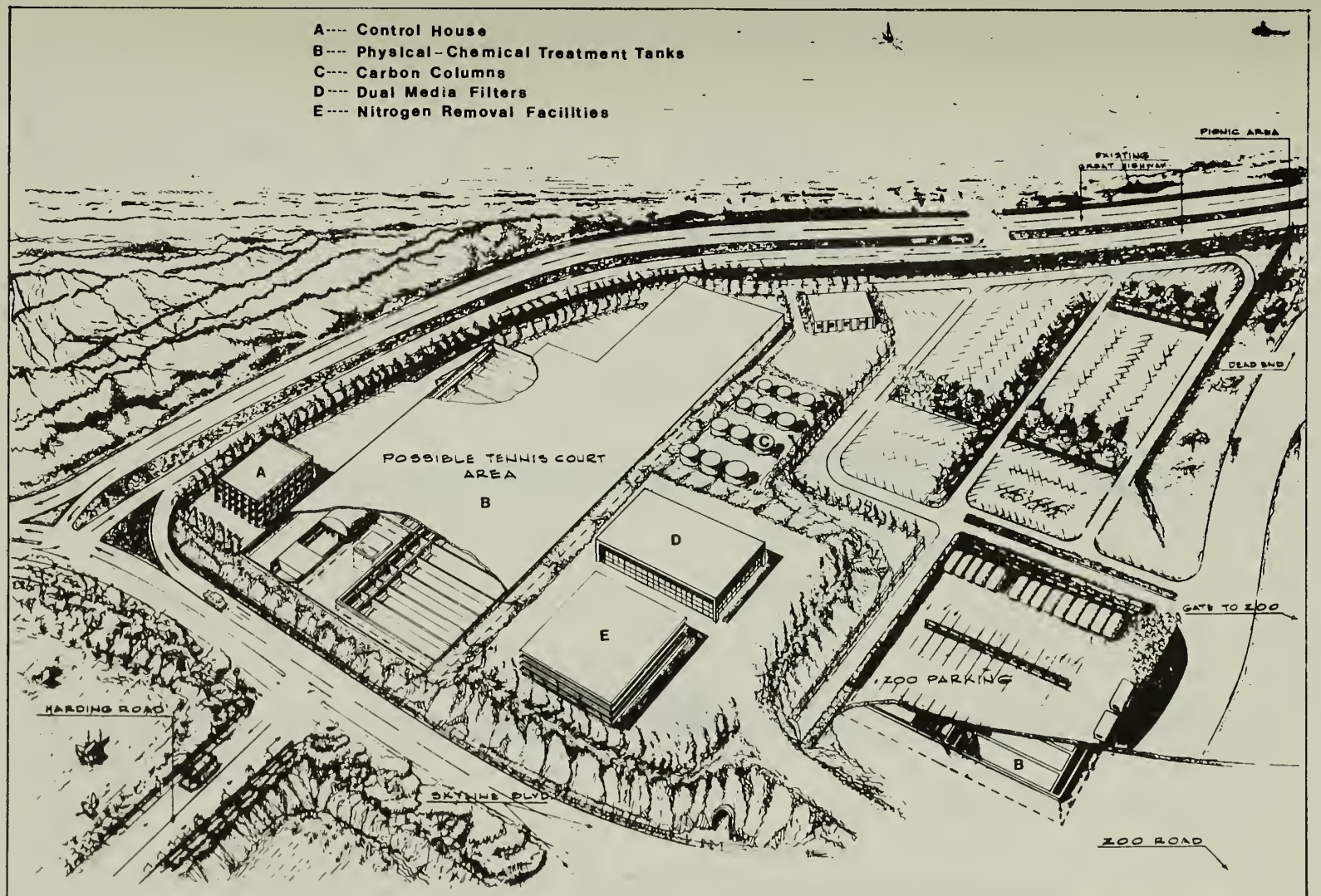
TOTAL DRY AND WET WEATHER FLOW
820 MGD
EXPANDED WET WEATHER FACILITY

CHEMICAL TREATMENT
1ST LEVEL 820 MGD
(2ND LEVEL - DRY WEATHER ONLY - 51 MGD AVG DAY)
(3RD LEVEL - DRY WEATHER ONLY - RECLAMATION - 51 MGD AVG DAY)

STAGE 16

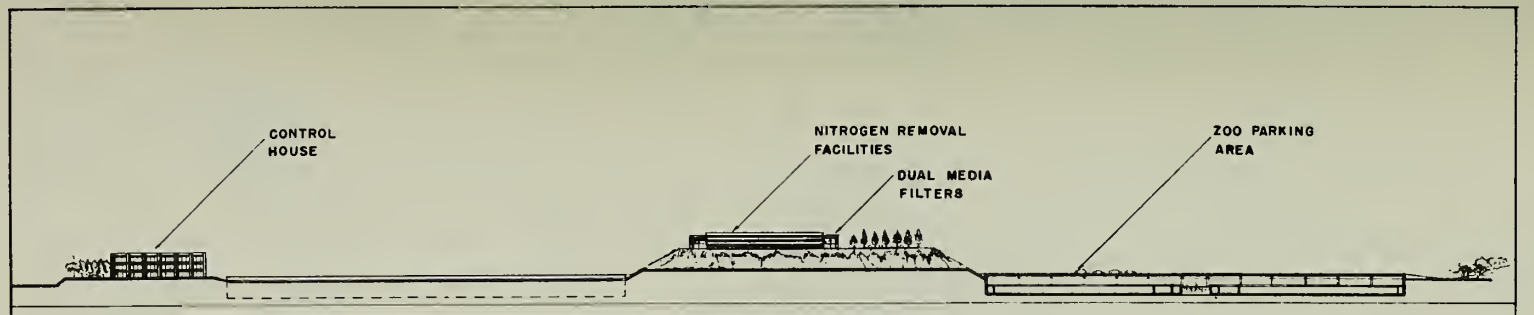
TOTAL DRY AND WET WEATHER FLOW
1,000 MGD
EXPANDED DRY AND WET WEATHER FACILITIES

1ST LEVEL 1,000 MGD
(2ND LEVEL - DRY WEATHER ONLY - 125 MGD AVG DAY)
(3RD LEVEL - DRY WEATHER ONLY - RECLAMATION - 125 MGD AVG DAY)

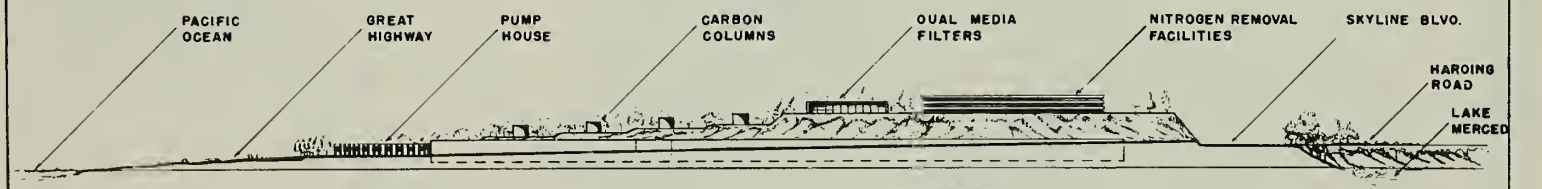


PERSPECTIVE OF PROPOSED COMBINED LAKE MERCED WATER POLLUTION CONTROL PLANT AND ZOO FACILITIES

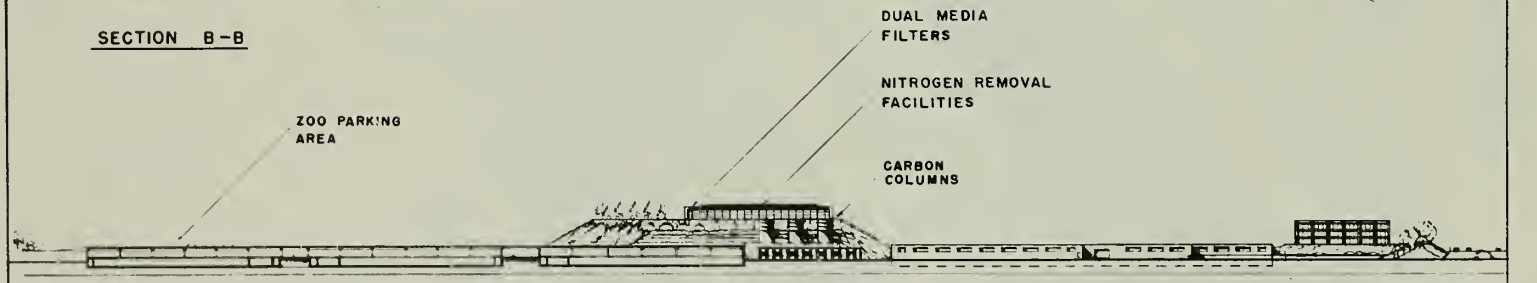
PLATE VI-23



SECTION A-A



SECTION B-B



SECTION C-C

0 100 200 300 400
GRAPHIC SCALE

CROSS SECTIONS THRU PROPOSED LAKE MERCED WATER POLLUTION CONTROL PLANT

PLATE VI-24

PROPOSED OUTFALL LOCATION

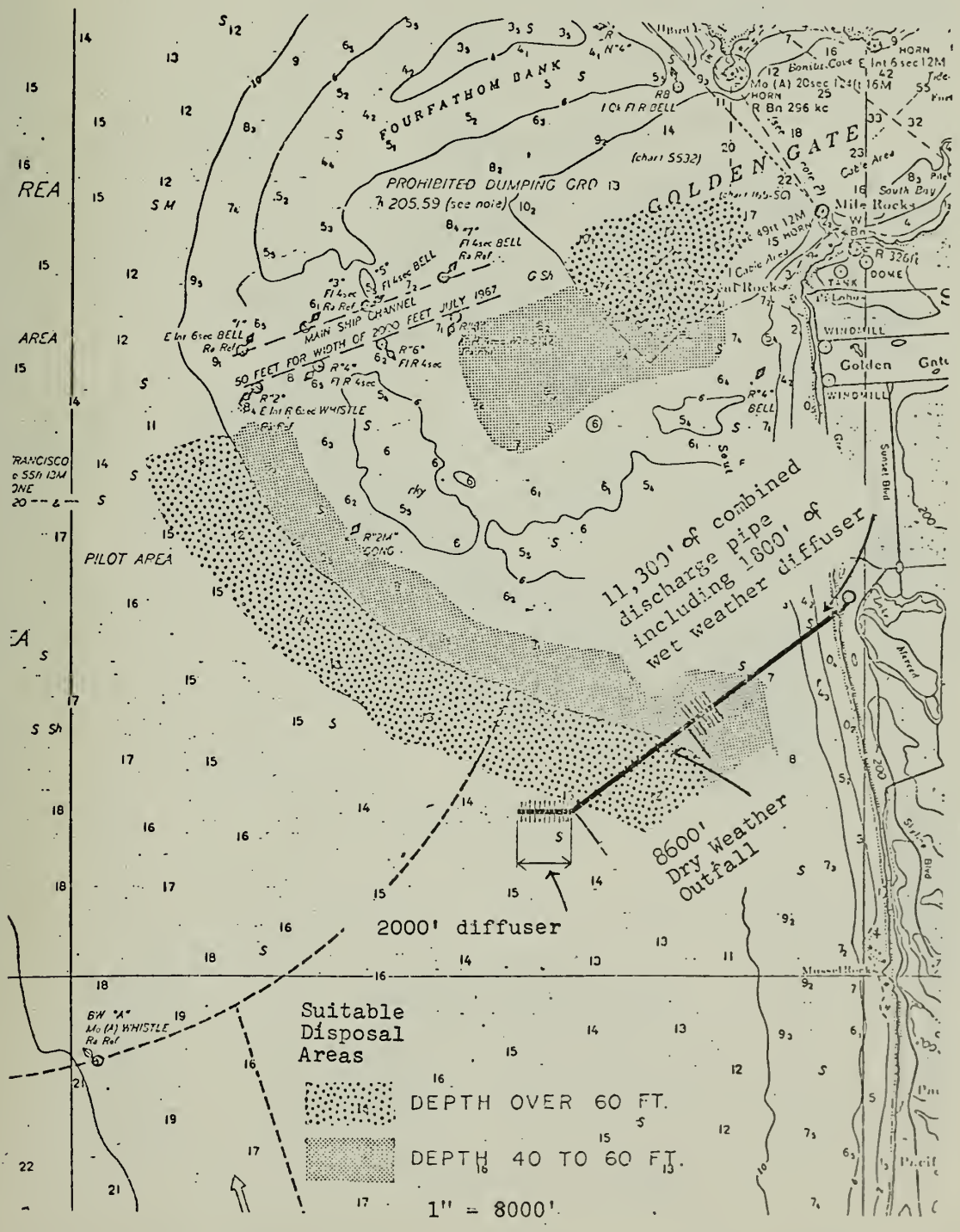
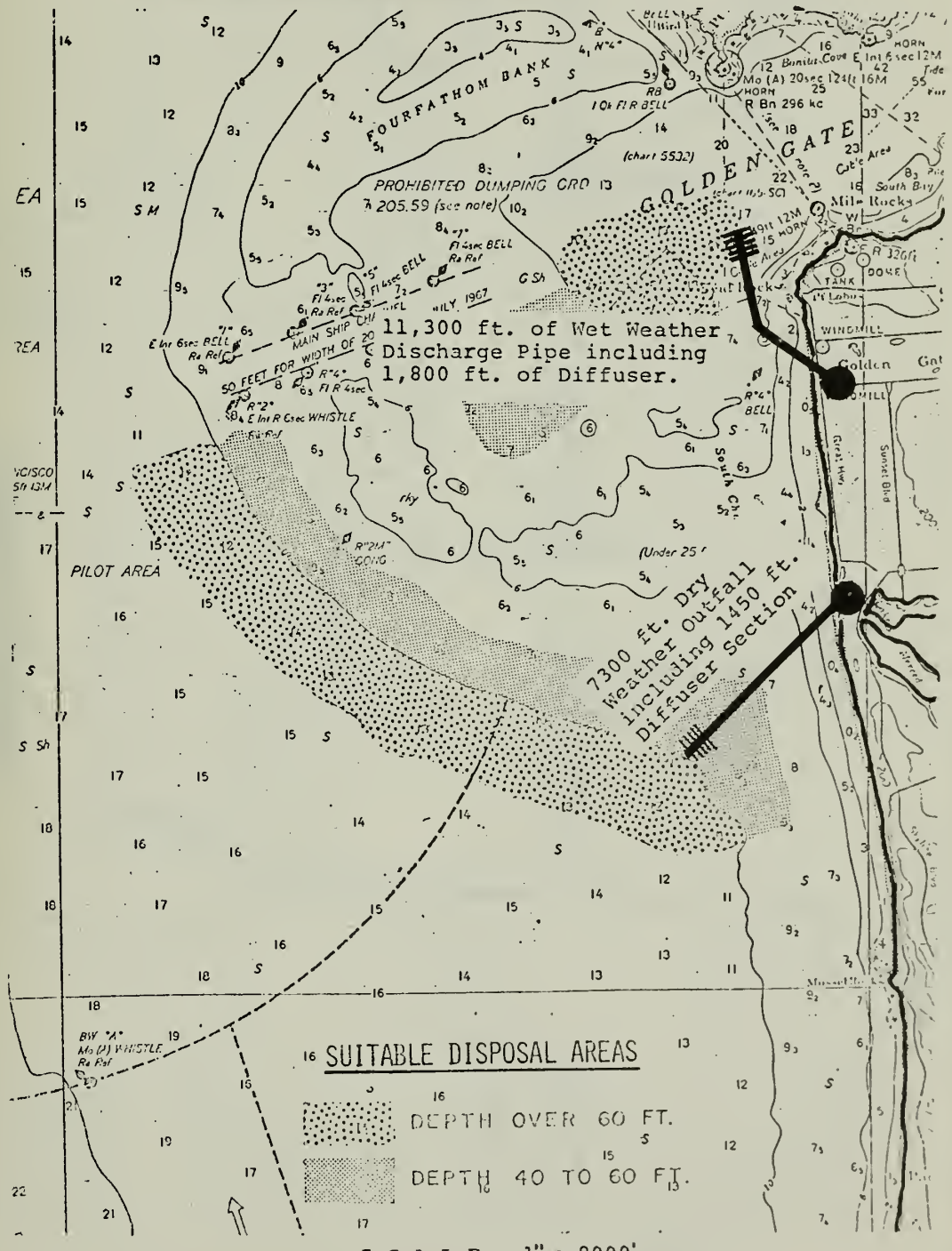

FOURFATHOM BANK
PROHIBITED DUMPING GRD
205.59 (see note)
GOLDEN GATE
MAIN SHIP CHANNEL
50 FEET FOR WIDTH OF 2000 FEET JULY 1967
PILOT AREA
11,300' of combined discharge pipe including 1800' of wet weather diffuser
8600' Dry Weather Outfall
2000' diffuser
Suitable Disposal Areas
DEPTH OVER 60 FT.
DEPTH 40 TO 60 FT.
1" = 8000'

PLATE VI-26

PROPOSED OUTFALL LOCATIONS


FOURFATHOM BANK
GOLDEN GATE
PROHIBITED DUMPING GRD
11,300 ft. of Wet Weather Discharge Pipe including 1,800 ft. of Diffuser.
7300 ft. Dry Weather Outfall including 1450 ft. Diffuser Section
PILOT AREA
SUITABLE DISPOSAL AREAS
DEPTH OVER 60 FT.
DEPTH 40 TO 60 FT.
SCALE : 1" = 8000'

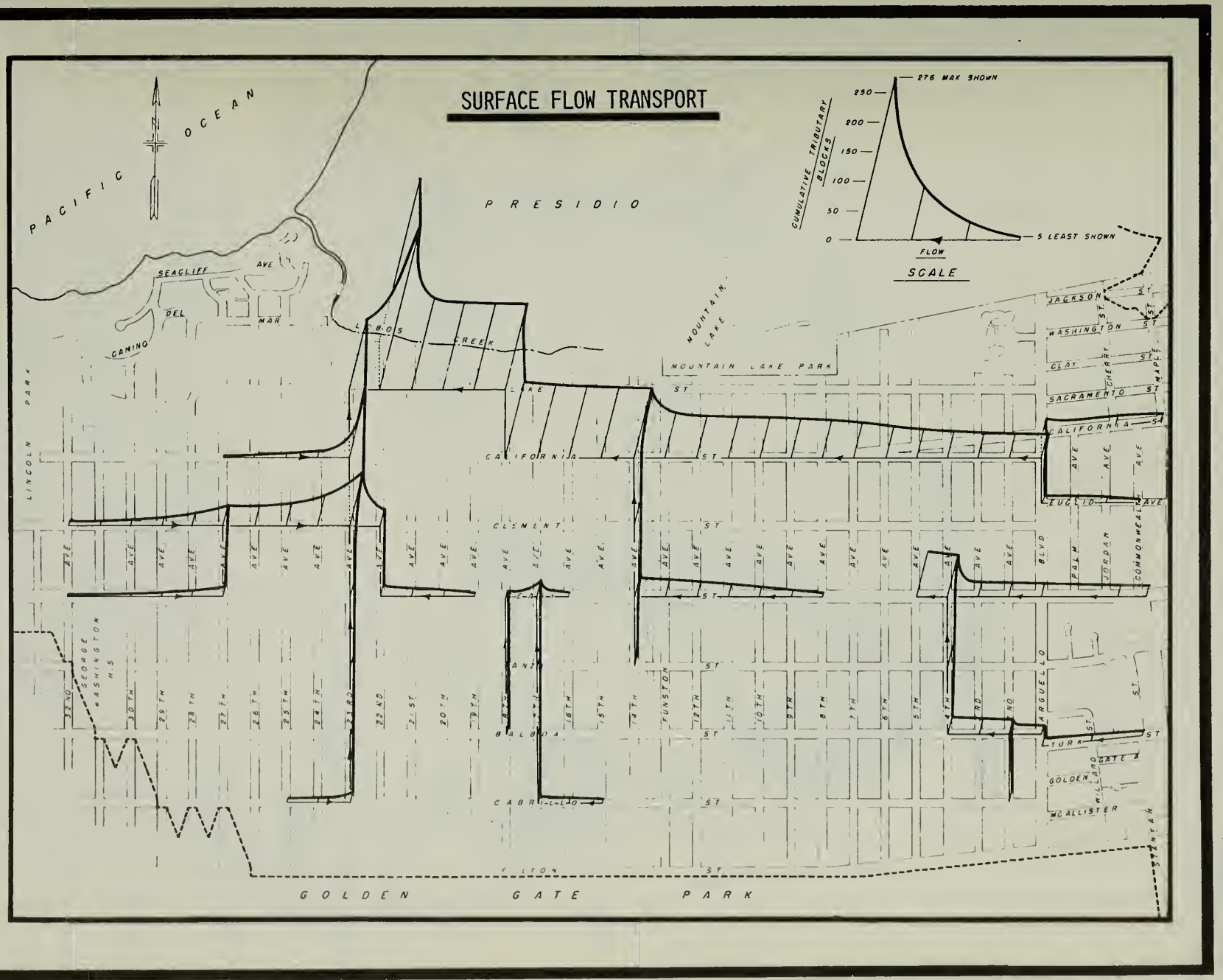
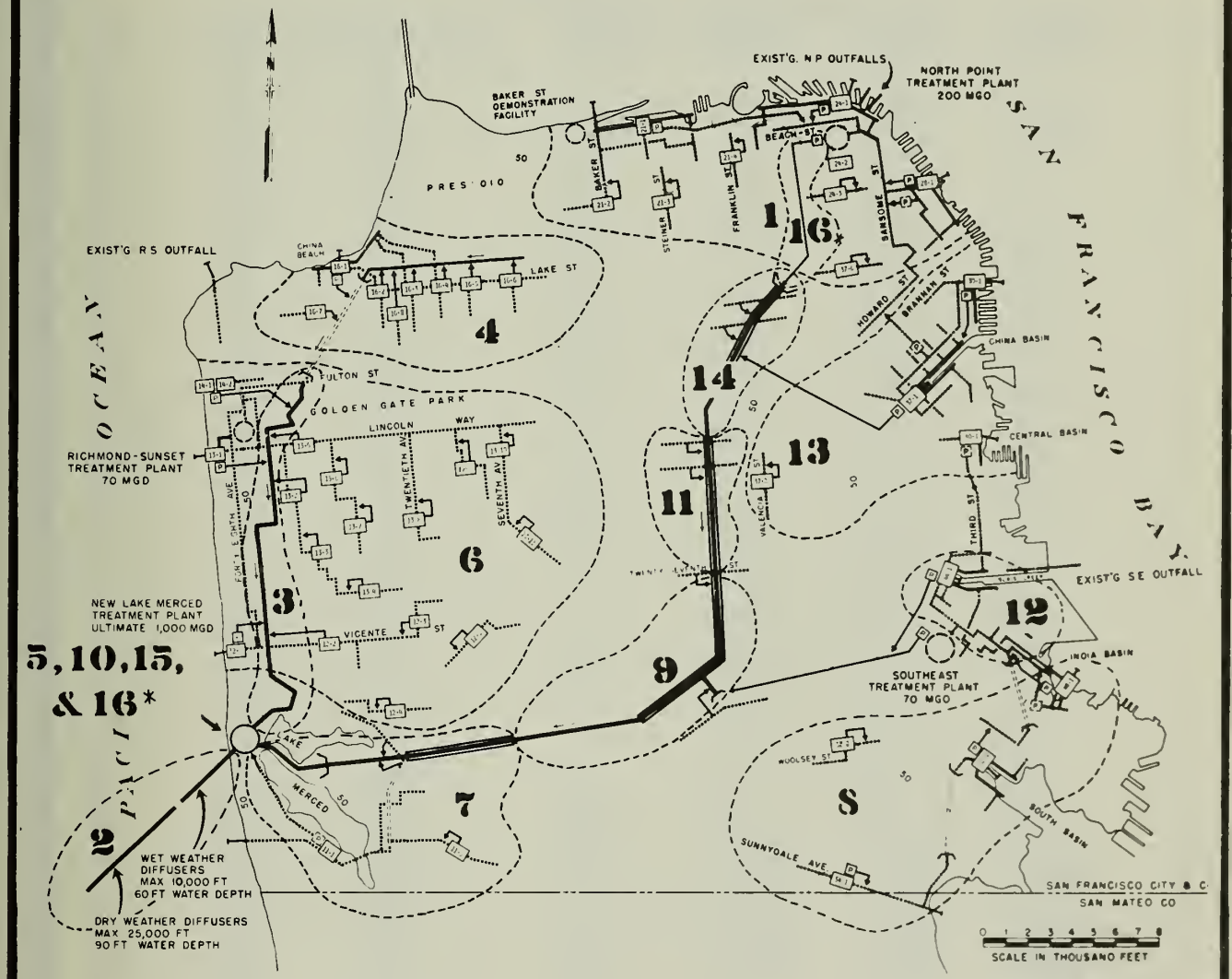

SURFACE FLOW TRANSPORT
PACIFIC OCEAN
PRESIDIO
SEACLIFF AVE
DEL MAR
CAMINO
LOBOS CREEK
LINCOLN PARK
MOUNTAIN LAKE
MOUNTAIN LAKE PARK
LAKE ST
CALIFORNIA ST
CLEMENT ST
ANZA ST
BALBOA ST
CABRILLO ST
FULTON ST
GOLDEN GATE PARK
JACKSON ST
WASHINGTON ST
CLAY ST
SACRAMENTO ST
EUCLID AVE
PALM AVE
JORDAN AVE
COMMONWEALTH AVE
ARGUELLO BLVD
GEORGE WASHINGTON H.S.
32ND AVE
30TH AVE
29TH AVE
28TH AVE
27TH AVE
26TH AVE
25TH AVE
24TH AVE
23RD AVE
22ND AVE
21ST AVE
20TH AVE
19TH AVE
18TH AVE
17TH AVE
16TH AVE
15TH AVE
14TH AVE
13TH AVE
12TH AVE
11TH AVE
10TH AVE
9TH AVE
8TH AVE
7TH AVE
6TH AVE
5TH AVE
4TH AVE
3RD AVE
2ND AVE
1ST AVE
FUNSTON AVE
TURK ST
GOLDEN GATE
MCALLISTER ST
STANYAN ST
276 MAX SHOWN
250
200
150
100
50
0
CUMULATIVE TRIBUTARY BLOCKS
5 LEAST SHOWN
FLOW
SCALE

PLATE VII-1

PLATE VII-2

STAGE CONSTRUCTION



PROJECT COST (MILLIONS OF DOLLARS)

ALTERNATE	STAGE 1	STAGE 2	STAGE 3	STAGE 4	STAGE 5	STAGE 6	STAGE 7	STAGE 8
A	20	30	15	12	33	27	18	20
B	27	30	15	17	33	38	20	26
C	39	30	15	28	33	67	26	40
D	53	30	15	38	33	96	32	58

ALTERNATE	STAGE 9	STAGE 10	STAGE 11	STAGE 12	STAGE 13	STAGE 14	STAGE 15	STAGE 16*	TOTAL
A	33	14	12	22	21	19	16	21	333
B	39	14	14	28	36	22	16	21	396
C	57	14	16	43	46	31	16	21	522
D	74	14	17	62	47	39	16	21	665

* STAGE 16 TO BE CONSTRUCTED ONLY IF NORTH POINT WPCP IS ABANDONED

LEGEND

OASHED LINES DENOTE EXIST'G FACILITIES
SOLID LINES DENOTE NEW FACILITIES

- RETENTION BASIN
- PUMP STATION
- TREATMENT PLANT
- TUNNEL
- TUNNEL WITH STORAGE SECTION
- FORCE MAIN
- SEWER
- OVERFLOW SITE
- —50— 50 FT CONTOUR LINE

AUGUST 24, 1971

PLATE VII-3

REQUIRED STORAGE

MASTER PLAN

BASIN #	ACRES CONTROLLED	TREATMENT RATE cfs @ 0.10 in/hr.	VOLUME MILLION CUBIC FEET ALTERNATE A (16%)	ALTERNATE B (29%)	ALTERNATE C (61%)	ALTERNATE D (100%)	STAGE
11-1	164	10.8	0.13	0.13	0.23	0.38	7
11-2	182	12.0	-	0.12(T)	0.25(T)	0.41(T)	7
11-3	175	11.6	0.10(T)	0.11(T)	0.25(T)	0.40(T)	7
11-4	761	50.2	0.23(T)	0.51(T)	1.07(T)	1.75(T)	7
11-5	258	17.1	0.10	0.15	0.36	0.59	6
12-1	207	13.7	0.10	0.14	0.30	0.48	6
12-2	715	47.2	0.27	0.48	1.00	1.64	6
12-3	129	8.5	0.10	0.10	0.18	0.30	6
12-4	222	14.5	-	0.15	0.31	0.51	6
12-5	276	18.2	0.10	0.18	0.38	0.63	6
13-1	673	44.5	0.46	0.46	0.95	1.55	6
13-2	186	12.5	-	-	0.26	0.43	6
13-3	122	8.1	0.10	0.11	0.18	0.28	6
13-4	126	8.3	0.10	0.10	0.18	0.29	6
13-5	605	40.0	-	0.40	0.85	1.39	6
13-6	154	10.2	-	0.14	0.21	0.35	6
13-7	101	6.7	0.10	0.10	0.14	0.23	6
13-8	145	9.6	0.10	0.10	0.20	0.33	6
13-9	165	10.9	-	0.11	0.23	0.38	6
13-10	153	10.1	-	0.14	0.21	0.35	6
13-11	387	25.5	0.18	0.26	0.55	0.90	6
14-1	60	4.0	-	-	0.10	0.14	6
14-2	390	25.7	0.16	0.30	0.55	0.90	6
15-1	100	6.6	0.23	0.23	0.23	0.23	4
15-2	88	5.8	0.10	0.10	0.12	0.20	4
15-3	112	7.4	0.10	0.10	0.16	0.26	4
15-4	168	11.1	0.10	0.13	0.24	0.39	4
15-5	413	27.3	-	-	0.58	0.95	4
15-6	456	30.1	0.10	0.30	0.55	1.05	4
15-7	124	8.2	-	0.11	0.18	0.29	4
15-8	189	12.5	-	0.13	0.26	0.43	4
21-1	484	31.9	0.18	0.32	0.68	1.11	1
21-2	109	7.2	0.10	0.10	0.16	0.25	1
21-3	108	7.1	-	0.10	0.16	0.25	1
21-4	229	15.1	0.10	0.15	0.32	0.53	1
24-1	401	26.5	0.22	0.30	0.56	0.92	1
24-2	90	5.9	-	-	0.13	0.21	1
24-3	102	6.7	-	0.10	0.14	0.23	1
28-1	508	33.5	0.19	0.34	0.71	1.17	1
30-1	262	17.3	0.10	0.17	0.37	0.60	13
37-1	2424	160.0	0.89	1.62	3.4	5.58	13
37-2	161	10.6	0.10	0.10	0.23	0.37	13
37-3	303	20.0	0.11	0.20(T)	0.43(T)	0.70(T)	11
37-4	189	12.5	0.10	0.12(T)	0.27(T)	0.44(T)	11
37-5	845	55.8	0.31	0.56(T)	1.18(T)	1.94(T)	11
37-6	80	53.0	-	0.10	0.11	0.18	1
37-7	330	21.8	0.12	0.22(T)	0.46(T)	0.76(T)	14
37-8	271	17.9	0.10	0.18(T)	0.38(T)	0.62(T)	14
37-9	453	29.9	0.17	0.30(T)	0.64(T)	1.04(T)	14
40-1	220	14.5	0.10	0.15	0.31	0.51	14
44-1	2589	170.9	0.98	1.77	3.72	6.10	12
44-2	220	14.5	0.10(T)	0.15(T)	0.31(T)	0.51(T)	12
44-3	469	31.0	0.17(T)	0.32(T)	0.66(T)	1.08(T)	12
44-4	88	5.8	0.10	0.10	0.12	0.20	12
44-5	2753	182.0	1.0(T)	1.83(T)	3.86(T)	6.33(T)	12
48-1	64	4.2	0.10	0.10	0.10	0.15	8
52-1	1239	81.8	0.46	0.83	1.74	2.85	8
52-2	378	24.9	0.14	0.25	0.53	0.87	8
54-1	949	62.6	0.35	0.64	1.33	2.18	8

TOTALS

(T) - Tunnel Storage

RETENTION BASIN DIMENSIONS

BOX NO.	LOCATION	ALTERNATE A				ALTERNATE B				ALTERNATE C				ALTERNATE D			
		Length (ft)	Width (ft)	Depth (ft)	Volume $ft^3 \times 10^6$	Length (ft)	Width (ft)	Depth (ft)	Volume $ft^3 \times 10^6$	Length (ft)	Width (ft)	Depth (ft)	Volume $ft^3 \times 10^6$	Length (ft)	Width (ft)	Depth (ft)	Volume $ft^3 \times 10^6$
11-1(P)	John Muir Drive Pump Station	120	60	18	.13	120	60	18	.13	213	60	18	.23	233	90	18	.38
11-3	Brotherhood Way & Thomas More	67	50	30	.10	67	75	30	.15	160	75	30	.36	198	100	30	.59
12-1(P)	Vicente & Great Highway	67	50	30	.10	93	50	30	.14	134	75	30	.30	159	100	30	.48
12-2	Vicente & Sunset Blvd.	145	75	25	.27	257	75	25	.48	267	150	25	1.00	329	200	25	1.64
12-3	Ulloa & 22nd Avenue	52	60	32	.10	52	60	32	.10	94	60	32	.18	155	60	32	.30
12-4	Eucalyptus & Melba					67	75	30	.15	138	75	30	.31	165	100	30	.51
12-5	Wawona & Ulloa	69	50	29	.10	124	50	29	.18	262	50	29	.38	435	50	29	.63
13-1(P)	Lincoln Way & Great Highway	154	100	30	.46	154	100	30	.46	211	150	30	.95	259	200	30	1.55
13-2	Lawton & 43rd Avenue									114	60	35	.24	204	60	35	.43
13-3	Pacheco & 35th Avenue	42	60	40	.10	46	60	40	.11	75	60	40	.18	117	60	40	.28
13-4	Santiago & 29th Avenue	52	60	32	.10	52	60	32	.10	94	60	32	.18	151	60	32	.29
13-5	Lincoln Way & 39th Avenue					154	100	26	.40	218	150	26	0.85	268	200	26	1.39
13-6	Kirkham & 30th					80	50	35	.14	120	50	35	0.21	202	50	35	.35
13-7	Noriega & 29th	67	50	30	.10	67	50	30	.10	93	50	30	.14	155	50	30	.23
13-8	Noriega & 20th	114	25	35	.10	114	25	35	.10	114	50	35	.20	177	50	35	.33
13-9	Kirkham & 12th Ave.					124	25	37	.11	124	50	37	.23	205	50	37	.38
13-10	Judah & 7th Avenue					88	50	32	.14	131	50	32	.21	219	50	32	.35
13-11	Clarendon & 7th Avenue	122	40	37	.18	176	40	37	.26	372	40	37	.55	398	60	37	.90
14-1(P)	Fulton & La Playa									98	60	17	.10	135	60	17	.14
14-2(P)	Fulton & 45th Avenue	154	60	19	.16	288	60	19	.30	324	90	19	.55	387	120	19	.9
15-1(P)	Sea Cliff Outfall	128	60	30	.23	128	60	30	.23	128	60	30	.23	128	60	30	.23
15-2	Lake & 24th Ave.	111	60	15	.10	111	60	15	.10	133	60	15	.12	231	60	15	.2
16-3	Lake & 22nd Ave.	111	60	15	.10	111	60	15	.10	178	60	15	.16	290	60	15	.26
16-4	Lake & 17th Ave.	83	60	20	.10	108	60	20	.13	200	60	20	.24	332	60	20	.39
16-5	Lake & 14th Ave.									174	120	28	.58	288	120	28	.93
16-6	Lake & 8th Avenue	108	25	37	.10	162	50	37	.30	297	50	37	.55	567	50	37	1.05
16-7	California & 28th Ave.					55	50	40	.11	90	50	40	.18	143	50	40	.29
16-8	Geary & 23rd Avenue					153	25	33	.13	158	50	33	.26	267	50	33	.43
21-1(P)	Marina Outfall	100	60	30	.18	178	60	30	.32	252	90	30	.68	309	120	30	1.11
21-2	Baker & Union	63	50	32	.10	63	50	32	.10	100	50	32	.16	157	50	32	.25
21-3	Steiner & Grove					49	60	34	.10	79	60	34	.16	120	60	34	.25
21-4	Lombard & Franklin	64	60	26	.10	96	60	26	.15	205	60	26	.32	332	60	26	.53
24-1(P)	Beach St. Outfall	122	60	30	.22	167	60	30	.30	207	90	30	.56	256	120	30	.92
24-2	Columbus & Union									62	60	35	.13	99	60	35	.21
24-3	Pacific & Stockton					70	40	36	.10	97	40	36	.14	165	40	36	.23
26-1(P)	Jackson St. Outfall	91	60	35	.19	162	60	35	.34	225	90	35	.71	278	120	35	1.17
30-1(P)	Brannan Outfall	67	50	30	.10	113	50	30	.17	164	75	30	.37	201	100	30	.60
37-1(P)	Division St. Outfall	262	90	35	.89	515	90	35	1.62	650	150	35	3.4	885	180	35	5.58
37-2	Valencia & 20th St.	186	20	27	.10	186	20	27	.10	213	40	27	.23	342	40	27	.37
37-6	Mason & O'Farrell					49	60	34	.10	54	60	34	.11	91	60	34	.18
40-1(P)	Mariposa Outfall	111	30	30	.10	167	30	30	.15	173	60	30	.31	281	60	30	.51
44-1(P)	Selby Outfall	187	150	35	.98	337	150	35	1.77	530	200	35	3.72	567	300	35	6.10
46-1(P)	Evans & Griffith	125	40	20	.10	125	40	20	.10	125	40	20	.10	185	40	20	.15
52-1(P)	Yosemite Outfall	153	100	30	.46	277	100	30	.83	290	200	30	1.74	475	200	30	2.85
52-2	Somerset & Wayland	97	40	36	.14	173	40	36	.25	368	40	36	.53	604	40	36	.87
54-1(P)	Sunnydale & Bayshore	167	60	35	.35	305	60	35	.64	422	90	35	1.33	519	120	35	2.18

(P) = Pumped

PLATE VII-4

PLATE VII-5

DAILY COMPOSITES OF HEAVY METALS
(NORTH POINT WPCP INFLUENT)

Date	Aluminum (mg/l)	Copper (mg/l)	Lead (mg/l)	Mercury (mg/l)	Titanium (mg/l)
July 30, 1970	1.5	0.16	0.03	0.01	<3
July 31, 1970	2.3	0.24	0.16	0.003	<3
Aug. 1, 1970	0.9	0.13	0.03	0.01	<3
Aug. 2, 1970	0.9	0.12	0.20	0.35	<3
Aug. 3, 1970	1.5	0.15	0.17	0.003	<3
Aug. 4, 1970	0.9	0.17	0.04	0.06	<3
Aug. 5, 1970	1.4	-	0.03	0.01	<3
Minimum	0.9	0.12	0.03	0.003	-
Average	1.5	0.16	0.09	0.06	<3
Maximum	2.3	0.24	0.20	0.35	-

DAILY COMPOSITES OF HEAVY METALS
(RICHMOND-SUNSET WPCP INFLUENT)

Date	Aluminum (mg/l)	Mercury (mg/l)
Aug. 12, 1970	0.16	0.002
Aug. 14, 1970	0.9	0.002
Aug. 15, 1970	1.8	0.001
Aug. 16, 1970	2.0	0.002
Aug. 17, 1970	1.6	0.001
Aug. 18, 1970	0.7	0.003
Minimum	0.16	0.001
Average	1.1	0.0018
Maximum	2.0	0.003

PLATE VII-7

DAILY COMPOSITES OF HEAVY METALS
(SOUTHEAST WPCP-INFLUENT)

Date	Aluminum (mg/l)	Chromium (mg/l)	Copper (mg/l)	Mercury (mg/l)	Zinc (mg/l)
Aug. 26, 1970	1.7	2.3	0.24	0.002	0.9
Aug. 27, 1970	1.4	1.1	0.28	0.0006	0.6
Aug. 28, 1970	1.7	4.6	0.21	0.12	1.0
Aug. 29, 1970	1.1	3.1	0.16	0.005	0.6
Aug. 30, 1970	1.9	2.4	0.15	0.001	0.4
Aug. 31, 1970	2.5	1.6	0.29	0.21	1.0
Sept. 1, 1970	5.7	4.6	0.44	0.001	1.1
Minimum	1.1	1.1	0.15	0.0006	0.4
Average	2.3	2.8	0.25	0.049	0.8
Maximum	5.7	4.6	0.44	0.21	1.1

PLATE VII-8

CONCENTRATION OF HEAVY METALS
DISCHARGE FROM EXISTING PLANTS

METAL	TREATMENT PLANTS[1]				RWQCB[2] MAX. LIMITS FOR OTHER DISCHARGERS (mg/l)	S.F.[3] DRINKING WATER
	SEWPCP EFFLUENT (mg/l)	RSWPCP EFFLUENT (mg/l)	NPWPCP EFFLUENT (mg/l)	FLOW WEIGHTED AVERAGE (mg/l)		
ALUMINUM (Dissolved)	0.92*	0.55*	0.67*	0.70*	1.0	0.020
CHROMIUM (Total)	0.74	0.03	0.19	0.27	1.0	0.001
COPPER	0.38	0.06	0.19	0.20	0.5[4]	0.025
IRON (Dissolved Any Sample)	not sampled	not sampled	not sampled	not sampled	7.0	0.020
IRON (Average of 5 consecutive samples)	4.60*	0.82*	1.90*	2.24*	3.0	not sampled
LEAD	0.04	0.01	0.28	0.18	0.5[4]	0.01
MERCURY	0.04	0.03	0.02	0.03	0.01	0.002
NICKEL	0.02	0.003	0.09	0.06	5.0	not sampled
ZINC	0.92	<0.03	0.28	<0.36	1.0	0.01

* Total

(1) Weekly Composite Sample from Treatment Plants:
   a) Southeast - 8/26 to 9/1/70.
   b) Richmond-Sunset - 8/12 to 8/18/70.
   c) North Point - 7/30 to 8/5/70.

(2) Requirements for U.S. Steel's Pittsburgh Plant.

(3) An average of the four sources of S.F. Drinking Water and date sampled are as follows:
   a) Hetch Hetchy Reservoir - May 19, 1970
   b) Calaveras Pipeline - May 21, 1970
   c) Crystal Springs Lines - May 22, 1970
   d) San Andreas Lines - May 26, 1970

(4) Tentative requirements for the City's North Point Plant would limit Pb to 0.05 mg/l and Cu to 0.05 mg/l or 0.5 mg/l with effluent bioassay survivals of 90% average in 96 hours and 70% minimum.

PLATE VII-9

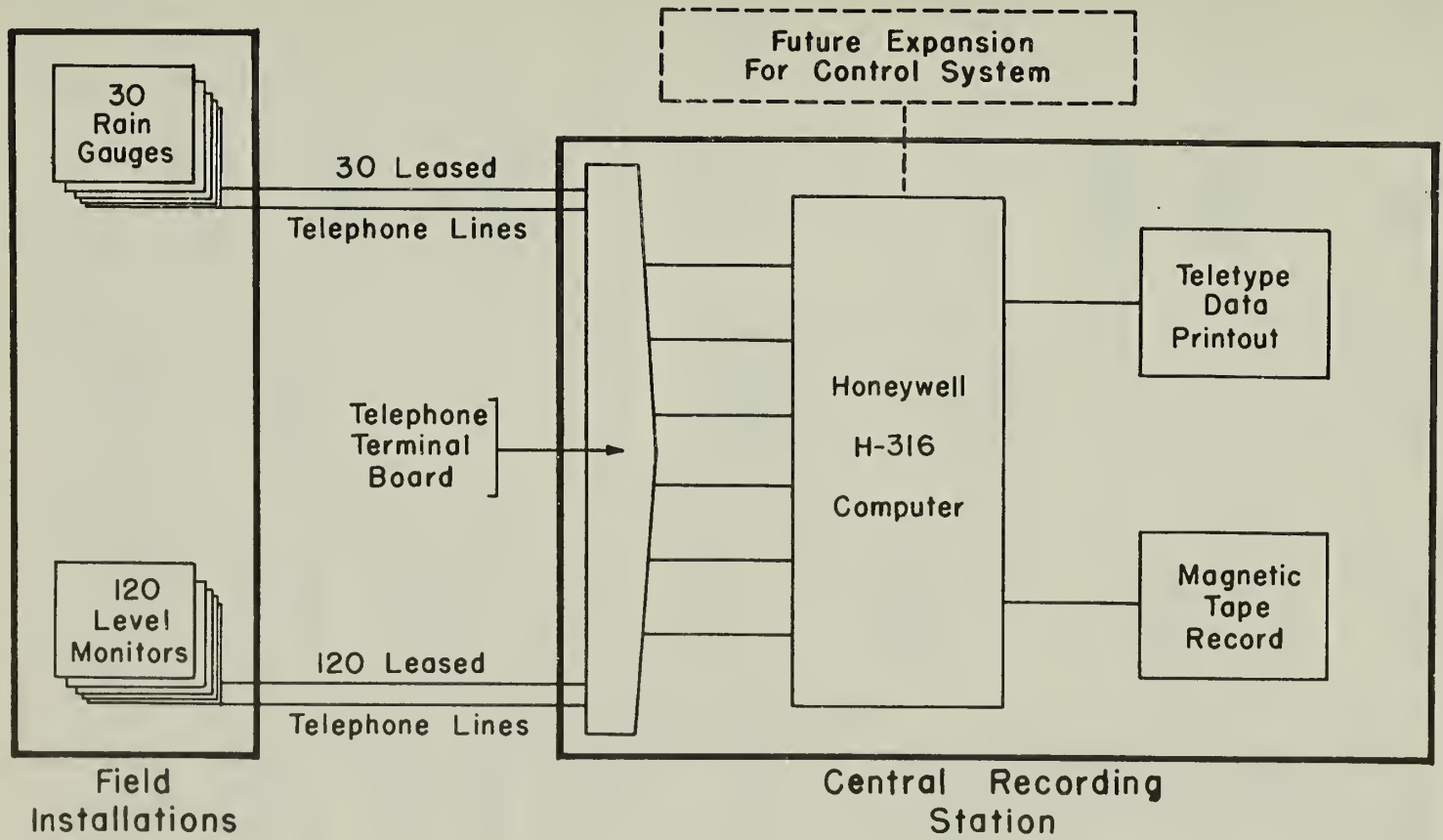
INFLUENT HEAVY METAL MASSES
INDUSTRIAL, MUNICIPAL, & TOTAL

METAL	TREATMENT PLANT INFLUENTS				DRINKING WATER ORIGIN (lbs/day)	MUNICIPAL[2] OR SANITARY ORIGIN (lbs/day)	INDUSTRIAL[3] ORIGIN (lbs/day)	PERCENT OF INDUSTRIAL ORIGIN
	NPWPCP (lbs/ day)	RSWPCP (lbs/ day)	SEWPCP (lbs/ day)	TOTAL (lbs/ day)				
ALUMINUM	740[1]	160	140	1,040	16.4	712	322	32
CHROMIUM	41	10	280	331	0.8	48	282	85
COPPER	83	16	57	156	21	57	78	50
IRON	1,200	260	420	1,880	16.4	1250	614	33
LEAD	120	2.6	6	129	8.2	4.8	116	90
MERCURY	30[1]	0.3[1]	8[1]	38	1.6	0	36.4	96
ZINC	170	16	140	330	8.2	70	252	76
FLOW (MGD)	59.0	20.2	19.2	98.4	98.4			

(1) Average of daily composites, the remainder of data is based on weekly composites. All sampling done during July to September 1970.

(2) Based on WPCP with the lowest concentration and extrapolated for the total City on a flow weighted basis and deducting the drinking water contribution.

(3) Calculated by difference between total and sum of drinking water plus sanitary contributions.



San Francisco Hydrologic And
Hydraulic Data Acquisition System
BLOCK DIAGRAM

PLATE VIII-1

PLATE VIII-2

DEVELOPMENT PHASE

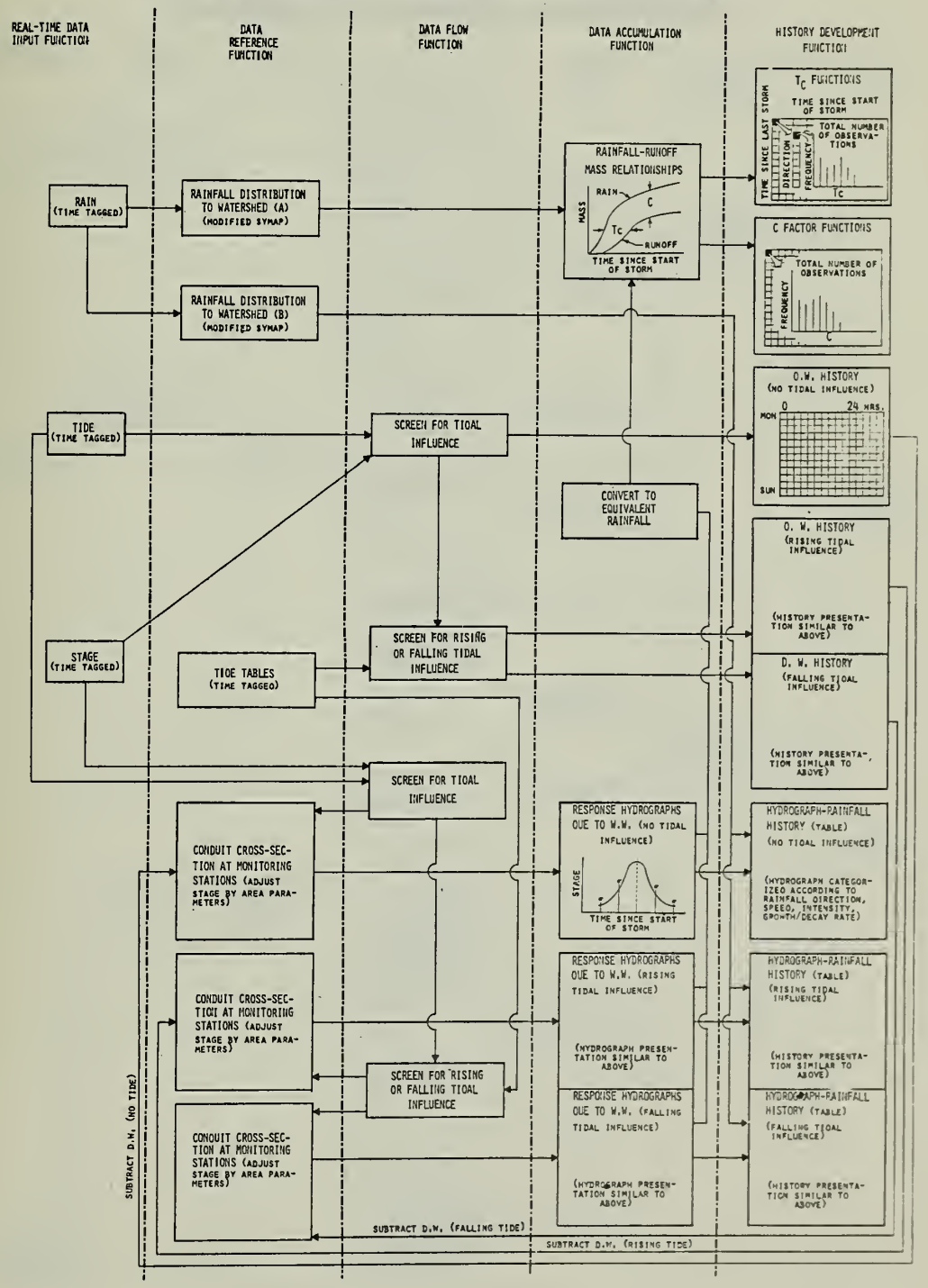

REAL-TIME DATA INPUT FUNCTION
DATA REFERENCE FUNCTION
DATA FLOW FUNCTION
DATA ACCUMULATION FUNCTION
HISTORY DEVELOPMENT FUNCTION
RAIN (TIME TAGGED)
RAINFALL DISTRIBUTION TO WATERSHED (A) (MODIFIED SYMAP)
RAINFALL DISTRIBUTION TO WATERSHED (B) (MODIFIED SYMAP)
RAINFALL-RUNOFF MASS RELATIONSHIPS
RAIN
C
Tc
RUNOFF
MASS
TIME SINCE START OF STORM
Tc FUNCTIONS
TIME SINCE START OF STORM
TIME SINCE LAST STORM
DIRECTION
FREQUENCY
TOTAL NUMBER OF OBSERVATIONS
C FACTOR FUNCTIONS
TOTAL NUMBER OF OBSERVATIONS
FREQUENCY
O.W. HISTORY (NO TIDAL INFLUENCE)
0
24 HRS.
MON
SUN
TIDE (TIME TAGGED)
SCREEN FOR TIDAL INFLUENCE
CONVERT TO EQUIVALENT RAINFALL
O. W. HISTORY (RISING TIDAL INFLUENCE)
(HISTORY PRESENTATION SIMILAR TO ABOVE)
STAGE (TIME TAGGED)
TIDE TABLES (TIME TAGGED)
SCREEN FOR RISING OR FALLING TIDAL INFLUENCE
D. W. HISTORY (FALLING TIDAL INFLUENCE)
(HISTORY PRESENTATION SIMILAR TO ABOVE)
SCREEN FOR TIDAL INFLUENCE
CONDUIT CROSS-SECTION AT MONITORING STATIONS (ADJUST STAGE BY AREA PARAMETERS)
RESPONSE HYDROGRAPHS DUE TO W.W. (NO TIDAL INFLUENCE)
STAGE
TIME SINCE START OF STORM
HYDROGRAPH-RAINFALL HISTORY (TABLE) (NO TIDAL INFLUENCE)
(HYDROGRAPH CATEGORIZED ACCORDING TO RAINFALL DIRECTION, SPEED, INTENSITY, GROWTH/DECAY RATE)
CONDUIT CROSS-SECTION AT MONITORING STATIONS (ADJUST STAGE BY AREA PARAMETERS)
RESPONSE HYDROGRAPHS DUE TO W.W. (RISING TIDAL INFLUENCE)
(HYDROGRAPH PRESENTATION SIMILAR TO ABOVE)
HYDROGRAPH-RAINFALL HISTORY (TABLE) (RISING TIDAL INFLUENCE)
(HISTORY PRESENTATION SIMILAR TO ABOVE)
SCREEN FOR RISING OR FALLING TIDAL INFLUENCE
CONDUIT CROSS-SECTION AT MONITORING STATIONS (ADJUST STAGE BY AREA PARAMETERS)
RESPONSE HYDROGRAPHS DUE TO W.W. (FALLING TIDAL INFLUENCE)
(HYDROGRAPH PRESENTATION SIMILAR TO ABOVE)
HYDROGRAPH-RAINFALL HISTORY (TABLE) (FALLING TIDAL INFLUENCE)
(HISTORY PRESENTATION SIMILAR TO ABOVE)
SUBTRACT D.W. (NO TIDE)
SUBTRACT D.W. (FALLING TIDE)
SUBTRACT D.W. (RISING TIDE)

PLATE VIII-3

PREDICTION PHASE

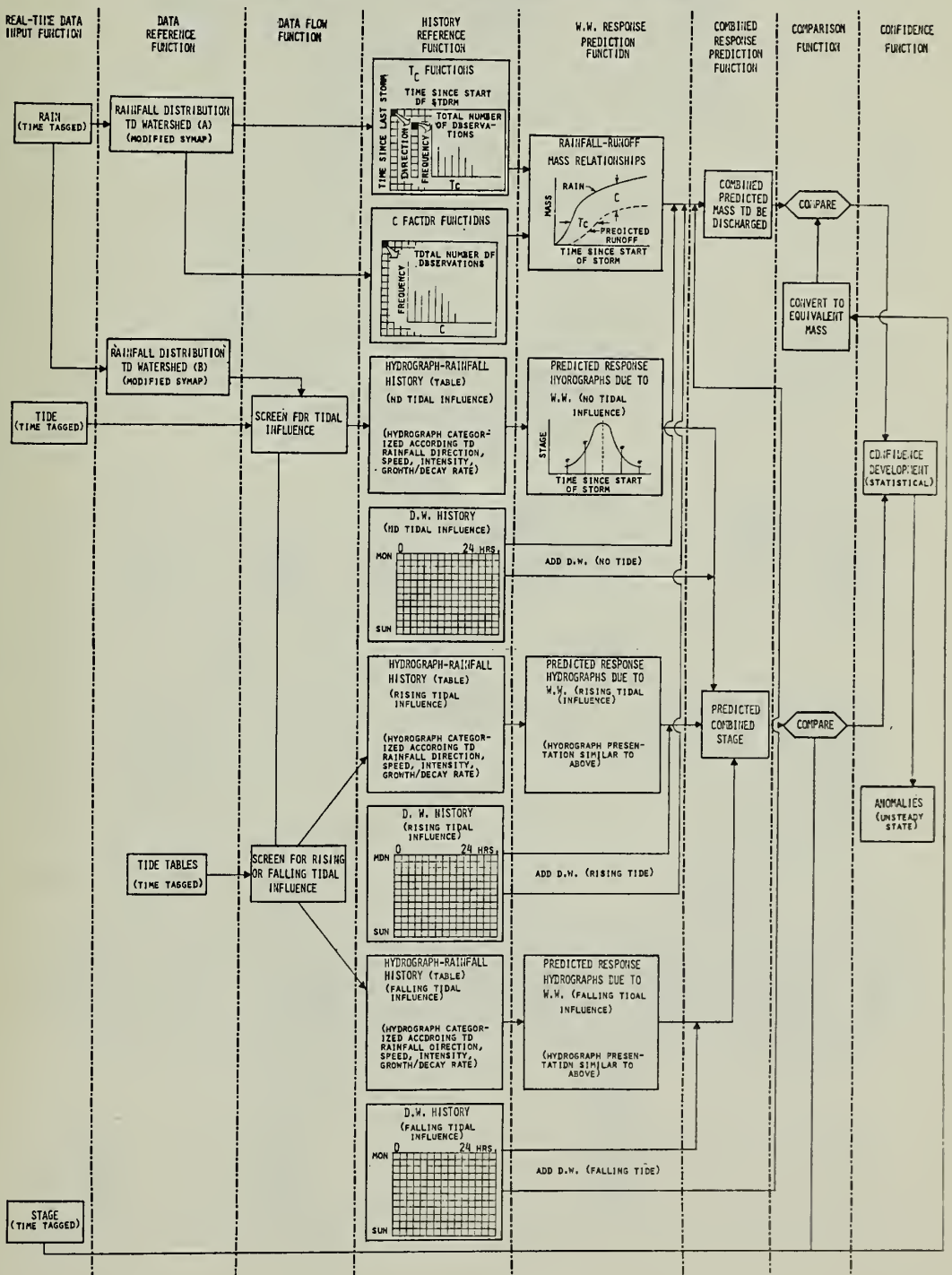
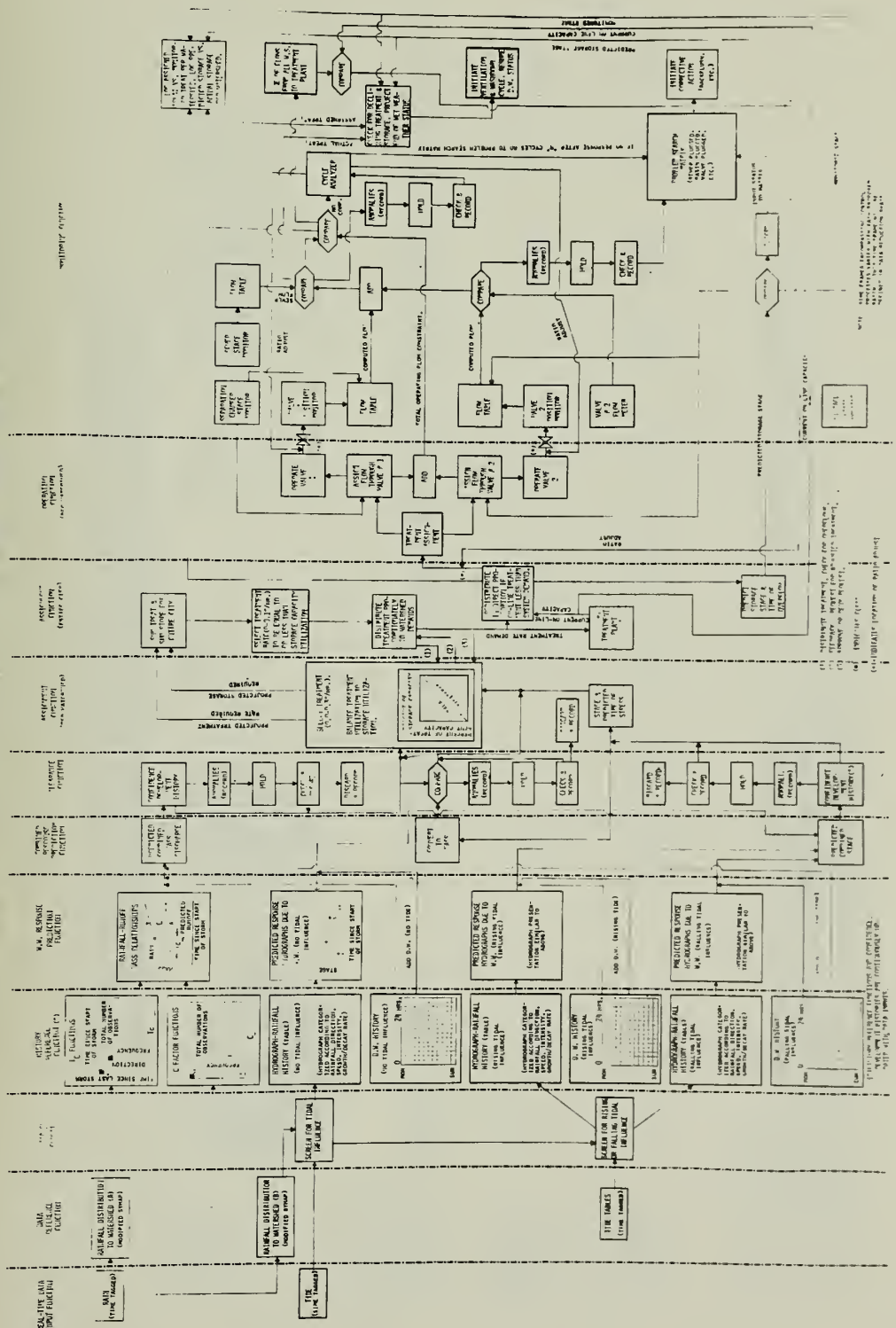


PLATE VIII-4

REAL-TIME CONTROL PHASE



POSSIBLE FUNDING AMOUNTS FOR CAPITAL COSTS WITH MINIMUM AND MAXIMUM POSSIBLE STATE AND FEDERAL FINANCIAL AID

	Funding Sources	Wet Weather Construction (Treatment Plant, Tunnels, Basins and Transport to Plant)	Dry Weather Construction (Treatment Plant and Transport to Plant)	Outfall	Side Sewers	Culverts and Catchbasin Construction	Replacement of Sewers
1A.	City of San Francisco	20% to 100%(1)	20% to 100%(1)	20% to 100%(1)	100%(2)	0% to 100%(3)	0% to 100%
2.	State Grants	0% to 25%	0% to 25%	0% to 25%	0%	0% to 100%	0% to 55%
3.	Federal Grants	0% to 55%	0% to 55%	0% to 55%	0%	0% to 55%	0% to 55%

(1) Property owners pay through Ad-Valorem tax (or use-charge when applicable).
(2) Cost paid by benefitted property owner.
(3) Initial cost paid by benefitted property owner.

PLATE IX-1

ANNUAL COSTS

Possible Funding Amounts of Maintenance and Operations

	Funding Sources	WW Treatment Portion (Tunnels, Basins, Pumps and etc.)	DW Treatment Portion and Outfall	Culverts and Catchbasin	DW Sewers Collection and Transport, and Pump Stations	WW Sewers Collection and Transport and Pump Stations	Wet Weather Outfall
1A.	City of San Francisco	100%(1)	100%(1)	100%(1)	100%(1)	100%(1)	100%(1)
2.	State Funds	0%	0%	0%	0%	0%	0%
3.	Federal Funds	0%	0%	0%	0%	0%	0%

DW Dry Weather
WW Wet Weather

(1) Property owners pay through Ad-Valorem tax (or use-charge when applicable).

PLATE IX-2

PLATE IX-3

OUTSTANDING BONDED INDEBTEDNESS LIMITS

1955-56 through 1970-71

Dollars in Millions to Nearest Million
(Reference: Controller's Annual Reports)

Fiscal Year	Total Outstanding Bonded Indebtedness Limitation (1)	Bonds Outstanding at End of Previous Fiscal Year	Limit of Future Bond Sales Subject to 12% Limitation	Unissued Bonds Subject to 12% Limitation
1956	246	112	134	51
1957	260	115	145	118
1958	272	127	145	147
1959	233	168	65	95
1960	242	184	58	64
1961	247	181	66	63
1962	255	186	69	54
1963	265	199	66	141
1964	271	192	79	104
1965	275	170	105	127
1966	287	163	124	148
1967	302	148	154	169
1968	361	142	219	144
1969	263	150	113	207
1970	270	158	112	177
1971	276	126	150	131

(1) Based upon 12% of City's total assessed valuation

PLATE IX-4

COMPREHENSIVE WASTE WATER MANAGEMENT PROGRAM

FACILITIES, COSTS AND FUNDS REQUIRED

Treatment

I. Dry Weather Facilities

a)	Cost	136.0 million
b)	Less 80% Grant Funds	-108.8 million
c)	Net City Funds Required during Program Period	27.2 million
d)	Funds Available	65.0 million
e)	Net Remaining Funds	37.8 million

II. Wet Weather Facilities

		Alt.A	Alt.B	Alt.C	Alt.D	
a)	Cost	333.0	396.0	522.0	665.0	million
b)	Less 80% Grant Funds	-266.4	-316.8	-417.6	-532.0	million
c)	City Funds Required during Program Period	66.6	79.2	104.4	133.0	million
d)	Funds Available	37.8	37.8	37.8	37.8	million
e)	Net Funds Required during Program Period	28.8	41.4	66.6	95.2	million

Transport

		20 Year Program	30 Year Program
I.	Costs		
a)	Inadequate Sewers	66.7 million	100 million
b)	Replacement Sewers	75.0 million	112.5 million
c)	Total Transport Costs	141.7 million	212.5 million
II.	Funds Available	6.0 million	6.0 million
III.	Net Funds Required during Program Period	135.7 million	206.5 million

PLATE IX-5

NET ADDITIONAL CITY BOND FUNDS AND
INTEREST REQUIRED FOR PROGRAMS

Millions of 1974 Dollars

20 Year Program

	Wet Weather Alternate A	B	C	D	
Treatment, Dry and Wet Weather	28.8	41.4	66.6	95.2	million
Transport, Inadequate and Replacement Sewers	135.7	135.7	135.7	135.7	million
Total Bonds	164.5	177.1	202.3	230.9	million
Interest(1)	79.0	85.0	97.1	110.8	million
Total	243.5	262.1	299.4	341.7	million

30 Year Program

	Wet Weather Alternate A	B	C	D	
Treatment, Dry and Wet Weather	28.8	41.4	66.6	95.2	million
Transport, Inadequate and Replacement Sewers	206.5	206.5	206.5	206.5	million
Total Bonds	235.3	247.9	273.1	301.7	million
Interest(1)	112.9	119.0	131.1	144.8	million
Total	348.2	366.9	404.2	446.5	million

(1) Interest calculated based upon 15 year redemption period at 6%.

PLATE IX-6

BOND ISSUE SCHEDULE

20 Year Program - Three Bond Issues

Millions of 1974 Dollars

	Wet Weather Alternate			
	A	B	C	D
Bond Election #1 - Nov. 1972				
Sewer Bonds	45.3	45.3	45.3	45.3
Treatment Bonds	0.0	0.0	0.0	0.0
sub-total	45.3	45.3	45.3	45.3
Bond Election #2- Nov. 1977				
Sewer Bonds	45.2	45.2	45.2	45.2
Treatment Bonds	14.4	20.7	33.3	47.6
sub-total	59.6	65.9	78.5	92.8
Bond Election #3- Nov. 1983				
Sewer Bonds	45.2	45.2	45.2	45.2
Treatment Bonds	14.4	20.7	33.3	47.6
sub-total	59.6	65.9	78.5	92.8

BOND ISSUE SCHEDULE

30 Year Program - Four Bond Issues

Millions of 1974 Dollars

	Wet Weather Alternate			
	A	B	C	D
Bond Election #1 - Nov. 1972				
Sewer Bonds	51.7	51.7	51.7	51.7
Treatment Bonds	0.0	0.0	0.0	0.0
Sub-Total	51.7	51.7	51.7	51.7
Bond Election #2- Nov. 1978				
Sewer Bonds	51.6	51.6	51.6	51.6
Treatment Bonds	9.6	13.8	22.2	31.8
Sub-Total	61.2	65.4	73.8	83.4
Bond Election #3 - Nov. 1985				
Sewer Bonds	51.6	51.6	51.6	51.6
Treatment Bonds	9.6	13.8	22.2	31.7
Sub-Total	61.2	65.4	73.8	83.3
Bond Election #4 - Nov. 1992				
Sewer Bonds	51.6	51.6	51.6	51.6
Treatment Bonds	9.6	13.8	22.2	31.7
Sub-Total	61.2	65.4	73.8	83.3

20 YEAR PROGRAM
ESCALATED BOND ISSUE

COSTS FOR FUTURE BOND ISSUES

@ 6% Escalation - 1974 Base Year

BOND ELECTION YEAR	Wet Weather Alternate A		Wet Weather Alternate B		Wet Weather Alternate C		Wet Weather Alternate D	
	1974 Cost (Millions	Inflated Cost Dollars)	1974 Cost (Millions	Inflated Cost Dollars)	1974 Cost (Millions	Inflated Cost Dollars)	1974 Cost (Millions	Inflated Cost Dollars)
November 1972	45.3	48.7	45.3	48.7	45.3	48.7	45.3	48.7
November 1977	59.6	84.7	65.9	93.5	78.5	111.4	92.8	131.8
November 1983	59.6	120.5	65.9	133.0	78.5	158.5	92.8	187.5
TOTAL	164.5	253.9	177.1	275.2	202.3	318.6	230.9	368.0

PLATE IX-8

30 YEAR PROGRAM
ESCALATED BOND ISSUE

COSTS FOR FUTURE BOND ISSUES

@ 6% Escalation - 1974 Base Year

BOND ELECTION YEAR	Wet Weather Alternate A		Wet Weather Alternate B		Wet Weather Alternate C		Wet Weather Alternate D	
	1974 Cost (Millions Dollars)	Inflated Cost	1974 Cost (Millions Dollars)	Inflated Cost	1974 Cost (Millions Dollars)	Inflated Cost	1974 Cost (Millions Dollars)	Inflated Cost
November 1972	51.7	55.6	51.7	55.6	51.7	55.6	51.7	55.6
November 1978	61.2	92.4	65.4	98.6	73.8	111.5	83.4	125.8
November 1985	61.2	138.9	65.4	148.3	73.8	167.5	83.3	189.0
November 1992	61.2	208.5	65.4	222.5	73.8	251.0	83.3	283.8
TOTAL	235.3	495.4	247.9	525.0	273.1	585.6	301.7	654.2

PLATE IX-9